

GEOLOGICAL SURVEY

OF

ALABAMA.

REPORT OF PROGRESS FOR 1876.

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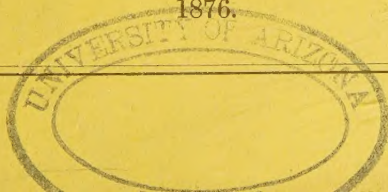
BY

EUGENE A. SMITH, PH. D.,
STATE GEOLOGIST.

MONTGOMERY, ALA.:

W. W. SCREWS, STATE PRINTER.

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To His Excellency,

GEORGE S. HOUSTON,

Governor of Alabama:

SIR—The Report of Progress of the Geological Survey,
for the year 1876, is herewith respectfully submitted.

I have the honor to be, sir,

Your obedient servant,

EUGENE A. SMITH,

State Geologist.

UNIVERSITY OF ALABAMA,

November 30, 1876.



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PREFACE.

In pursuance of the plan followed in previous years, the field work of the Survey during the past season, has been devoted chiefly to the Silurian formations exposed in the anticlinal valley, known as Roup's Valley and Jones' Valley. Incidentally, the geological formations, more recent than the Silurian, exhibited in this valley, have received attention. It has been seen in previous reports, that the Silurian formation in Alabama is the great repository of iron ores. In the valley, in part described in this Report, both the red and the brown ores occur in great abundance and of superior quality. The banks of brown ore are in some parts of the valley, of extraordinary extent. The close proximity of the ores, both red and brown, to the coal fields of the Warrior and Cahaba, will, some day, make this one of the chief centers of the iron industry in Alabama.

To the knowledge of the Coosa coal fields, we are enabled to make in this Report a small contribution, in the determination of the limit towards the south and southwest of this field. The capabilities of this portion of the field are, as yet, almost unknown.

The objects of the Survey include, amongst other things, the study and description of the fauna and flora of the State, and as the first contribution in this direction, we present with this Report a list of the Fresh Water and Land

Shells of Alabama, with remarks upon their Geographical Distribution, from the pen of Dr. James Lewis, of Mohawk, N. Y., one of the first authorities on this subject.

The labors of Dr. Lewis, in the conchological department of the National Museum of the Smithsonian Institution, are well known to Naturalists. To the working student of Natural History, this paper will be heartily welcomed.

It is due to Mr. Truman H. Aldrich, of Montevallo, to state that it is owing to his liberality that we are enabled to publish this list, as he has defrayed the entire expense incurred in its preparation.

To the authorities of the Alabama and Chattanooga, and the South and North Alabama Rail Roads, acknowledgments are herewith made for the continuation of courtesies extended to the Survey in previous years.

Prof. Wm. C. Stubbs, of the Agricultural and Mechanical College, and Prof. R. B. Fulton, of the University of Mississippi, have taken an active part in the field work during the past summer, and it is my pleasant duty to recognize here obligations to them for the assistance they have rendered.

A general acknowledgment of the indebtedness of the Survey to individuals, at whose hands many favors have been received, is hereby made.

EUGENE A. SMITH.

University of Alabama, November 30, 1876.

ROUP'S AND JONES' VALLEYS.

INTRODUCTORY.

In his first Report on the Geology of Alabama, Prof. Tuomey, in speaking of the Silurian rocks of this part of the State, says: "They (the Silurian rocks) are visible about sixteen miles in a straight line south-east of Tuska-loosa, where the waters of the Big Sandy Creek have removed the overlying loose materials that cover the surface of this part of the State. From this they extend north almost without interruption, to the head of Murphree's Valley, separating the Warrior coal field on the west from that of the Cahaba on the east. In this direction they are confined to a series of continuous valleys, that rarely exceed seven or eight miles in breadth; they are, in truth, but one valley, although designated by different names. The southern extremity has received the name of Roup's Valley; the middle portion, which includes the towns of Jonesborough and Elyton, and extends to Village Springs, is called Jones' Valley; whilst the part between the Village Springs and the upper extremity, where it is lost in the Racoon Mountain, has the appellation of Murphree's Valley."

The fact that this valley occupies the summit of an anticlinal fold was also noticed by Tuomey.

During the past season, the field work of the Survey has been devoted chiefly to the examination of the southwest portion of the valley known as Roup's and Jones' Valleys.

Before proceeding to the description of the geological

structure of the valley, it may be well, for the convenience of the reader, to give a short table of the sub-divisions of the Silurian, Devonian and Carboniferous formations.

A more extended description of these formations, as exhibited in some parts of Alabama, will be found in my Report for 1875.

Beginning with the lowest, these sub-divisions are :

A.¹ LOWER SILURIAN.

1. Acadian.
2. Potsdam.
3. Calciferous—Knox Sandstone.
4. Quebec— { Knox Shale.
Knox Dolomite.
5. Chazy.
6. Trenton.
7. Utica.
8. Cincinnati.

A.² UPPER SILURIAN.

1. Niagara.

The remaining sub-divisions of the Upper Silurian have not yet been observed in Alabama.

B. DEVONIAN.

1. Hamilton (?) Black Shale.

C. CARBONIFEROUS.

1. Siliceous Group.
2. Mountain Limestone. } Sub-Carboniferous.
3. Coal Measures—Carboniferous.

As we meet in this valley for the first time, with considerable exposures of the rocks of the Niagara period, which were only casually mentioned in my Report for 1875, a more detailed description will not be out of place here.

The New York geologists, to whom we owe the classifi-

cation and description of the Silurian beds, have divided the Niagara into three groups, as follows, beginning with the lowest :

1. *Medina*.—Including the Oneida Conglomerate, and the Medina Sandstone.

2. *Clinton*.—Sandstones and Shales, with beds of lenticular and fossiliferous red iron ore.

3. *Niagara*.—Shales and limestones.

Of these three groups of the Niagara period, so far as is known, only the second, *the Clinton*, has been certainly identified in Alabama. In Tennessee, the group has received the name of the *Dyestone Group* from Prof. Safford, on account of the occurrence in it of the red ore, or dyestone. In Alabama, no more fitting name could be given to it than the *Red Mountain* group, for outcrops of the rocks of this group are found in ridges, or mountains, as they are called, extending almost without interruption from Bibb county to Georgia, and beyond. From the red ore, which seems always to be present in them, in greater or less thickness, these ridges have the local name of the Red Mountain.

The name Clinton, however, has already been applied to this group of rocks, and a multiplication of names for the same thing is to be avoided if possible.

The rocks of the Clinton group in Alabama, are chiefly thin sandstones and shales, which are variously colored—green, yellowish, brown and red colors being predominant. The group contains also several beds of lenticular or fossiliferous red iron ore. For characteristic sections of the strata of the Clinton group, the reader may be referred to the section near Tannehill, and that at the mines of the Eureka Company.

The sandstones and ore beds of this formation, hold, locally, great numbers of characteristic fossils, amongst which *Pentamerus oblongus*, usually represented by the casts of the interior of the shell, and varieties of corals and

bryozoans, are nearly always found. So far as the fossils go, there is no reason for thinking that any of the Oneida and Medina rocks are represented in the Red Mountain ridges of Roup's and Jones' Valley.

GENERAL ACCOUNT OF THE GEOLOGICAL HISTORY AND STRUCTURE OF THE VALLEY.

During the period of disturbance, which, according to the geological authorities, followed the deposition of the Coal Measures, a comparatively narrow belt of land, running approximately parallel to the outline of the Atlantic coast, from the Green Mountains and beyond, down to Alabama, was pressed up into numerous wrinkles or folds. This belt has received the name of the Appalachian region, and includes the Blue Ridge and the Alleghany Mountains. Going across this region from the Atlantic, northwestward, we should accordingly expect to find a series of ridges with trough-like depressions between; we should expect to find the strata of the ridges sloping away southeast and northwest from the axis of the ridges, and the strata of the depressions sloping both ways towards the central line or axis of the depressions; in other words, we should expect to find a series of *anticlinal* ridges and *synclinal* troughs. The atmospheric agencies, during the long period which has elapsed since the disturbances alluded to, have, however, tended to obliterate the features thus impressed upon the land, by wearing down the crests of the ridges, and in some cases filling up the depressions between them, so that almost the whole of what now constitutes the scenery of this region—its mountains and valleys—is the result of denudation. The strata are still found lying at various inclinations to the horizon, sloping sometimes on both sides away from a central line, and sometimes on both sides towards a central line; but the anticlinals do not now mark the ridges, nor the synclinals the valleys, but the ridges or mountains, as we now find them, owe their prominence,

generally, to a capping of harder strata, such as sandstones, &c., which has resisted denudation, whilst the valleys have been excavated out of the softer materials, such as limestones, and the like.

But there are other sources of complication in the geological structure of this area. The strata have sometimes been too stiff and unyielding to *bend* into the sharp folds into which they have been pressed, and the result has been a break or crack along the line of greatest strain, *i. e.*, the top of the fold, just as we can break a sheet of stiff card board by bending it up into a close fold. The fissure thus produced has furnished a channel for the denuding streams which have excavated valleys along the crests of anticlinal ridges. In this way, the anticlinal valleys have been formed. And then, in many instances, the strata have yielded still less to the folding, the fracturing has been still more profound, and the strata on one side of the fracture have been pushed up over the corresponding strata on the other side, producing dislocations, or *faults*, as they have been termed. These faults are often miles in length, and the vertical displacement varies from a few feet up to thousands.

Flexures and faults are common throughout the whole of the Appalachian region, which has its southwestern termination in Alabama.

The valley which we are describing lies at the southwestern end of this region, and an account of its geological structure will, it is hoped, be more easily understood after the foregoing remarks.

As already noticed by Prof. Tuomey, this valley occupies the summit of an anticlinal fold, having the coal basin of the Warrior on the west, and that of the Cahaba on the east. A simple reference to the map will show that it is the water shed between these two coal basins, for all the creeks having their sources in the valley, soon break through the ridges of Millstone Grit at the base of the Coal Measures, and make their way into the Warrior and Cahaba. The rugged, barren hills of the coal fields contrast

strikingly with the rolling, fertile lands of the valley, and we have presented here, as has been remarked by Prof. Safford, the curious case of a valley which is higher than the mountains. The geological structure of the region is, in general, as follows: In the middle of the valley, the strata belong to that sub-division of the Lower Silurian which I have called Quebec or Knox Dolomite; these rocks are found dipping generally towards the southeast, though in many places they dip both northwest and southeast. Crossing from the center of the valley southeast, towards the Cahaba coal fields, we go over the rocks of the Chazy and Trenton, the Niagara, the Black Shale, the Sub-Carboniferous, the Millstone Grit, and the Shales and Sandstones of the Coal Measures, all lying conformably and dipping southeast. Going northwestward, we find the same succession of strata up to the Coal Measures of the Warrior fields, the dip being sometimes northwest, though often southeast, a fact to be explained further on. Such, in the simplest terms, is the geological structure, and there is no doubt but that the coal basins of the Warrior and the Cahaba were once continuous; that at the time of the disturbances along the Appalachians, alluded to above, they, together with the underlying formations, down at least to the Quebec or Knox Dolomite, were uplifted into a long anticlinal fold; that this fold was fractured along its axis or summit, thus affording a channel for denuding waters; and finally, that the great mass of sandstones, coal beds, shales and limestones, which constituted the fold, has been broken down and removed by the action of running waters, till nothing is left of it now except a low rim on each side, adjacent to the Coal Measures.

The structure of the entire valley, however, is not always that of a simple regular anticlinal, with its beds sloping away on both sides from the center. In the southwestern extremity, the fold has been lapped together and pushed over towards the northwest, reversing the dip, so that all the strata dip southeast, and the newer rocks on the northwestern side are found *under* the older ones. As

a further complication of the structure, it may be added that in many places there are faults or dislocations, by which, on the one hand, some of the beds have been concealed, and, on the other hand, some have been duplicated. Instances of both kinds of faults will be noticed in the details below.

The narrowness of the valley, six to eight miles, from coal field to coal field, and its abundance of iron ores, consisting of limonites, and of the fossiliferous red ores, the latter forming part of a ridge on each side of the valley, the practically inexhaustible quantity of good limestones, combine to render this portion of the State peculiarly adapted to the production of iron.

GEOLOGICAL DETAILS.

Going southeast from Tuskaloosa, towards Scottsville, rocks of the Coal Measures form the country as far as the Hardy Clements old place, in S. 25, T. 22, R. 8, W. Along this road, coal has been dug at times at Kennedale, at Mrs. Armistead's, S. 30, T. 21, R. 8, W., at Mr. Bowen's, S. 22, T. 22, R. 8, W., and at many other places. At Mr. Bowen's, on Lie Branch, is the last exposure of coal, so far as is yet known, towards the south, and a short distance below his place the deposits of the drift cover everything.

At Mr. Ben. Clements', on the old Hargrove road, about S. 3, T. 24, R. 7, W., the waters of Big Sandy have cut through the Millstone Grit, here exposed in two heavy ledges standing nearly vertical and striking almost north and south. This is the lowest exposure of this rock yet observed, and here the distinctive features of the anticlinal valley seem to be lost under overlying drift. The lithological characters of the Millstone Grit here, as at all other places where it has been observed in this valley, are those of a quartzose sandstone, or sometimes a conglomerate. Under the lens, it is seen to be composed almost

exclusively of quartz grains, and is very unlike, in appearance, the ordinary sandstones of the Coal Measures.

The ledges of this rock are exposed on both sides of the creek; on the south side they can be traced only a short distance, but northward and northeastward, as far as Birmingham, and, indeed, probably to the head of Murphree's Valley, the same rock is found in nearly vertical ledges, marking the western limit of the valley.

Going from this lowest outcrop of the Millstone Grit, northeastward, no well-defined exposure of the red ore of the Clinton group was observed, though a sandstone, having many of the characteristics of the Clinton sandstone is seen on the old Hargrove road, a mile or two southwest of the Hardy Clements old place, and at the last named locality, the strata of Knox Dolomite are seen in great force. It seems probable that the Knox Dolomite outcropping here, belongs to the lower beds of the group, for there are many strata of a blue banded argillaceous limestone, such as characterize the lower part of the Dolomite elsewhere, at Montevallo for instance.

At the ford, a thin bedded limestone strikes nearly north and south, dipping east, but a short distance higher up the creek, the characteristic sandy dolomite, with rough, hacked surfaces, lies in thick beds, striking north 15° east, and dipping southeast 35° - 40° . Several beautiful and bold springs burst up from beneath the dolomite. One of these, the Blue Spring, so called from the color of the water, has a basin about ten feet square. The water boils up in considerable volume, and this spring, which is about half a mile above the ford, is a fair type of the numerous limestone springs which characterize this formation.

Strata of the Knox Dolomite are exposed along the course of Big Sandy, below Clements', at least as far south as S. 2, T. 24, R. 7, E., of the lower survey. Northward from Clements' they are seen along a little branch, tributary to Big Sandy, in sections 24 and 18, T. 22, R. 8, W., upper survey, and northeastward are outcrops at intervals

along Big Sandy, in sections 24, 25, 17 and 16, of T. 22, R. 7, W. At the latter place are the lime kilns.

At Mr. Frank Goodson's place, S. 2, same township and range, these rocks are observed again, continuing thence probably without material interruption northeastward to Vance's, and up the valley. From Goodson's south, or a little southeast, to Mars P. O., and on to the Hill place, they make the country. Beyond Hill's, in this direction, we soon come upon the rocks of the Cahaba coal fields. The intervening rocks, viz: Chazy and Trenton, Clinton, Black Shale, and Sub-Carboniferous, I have not noticed in this immediate vicinity, though they are seen fully developed a few miles further northeast.

In going northward from the Hardy Clements place to Clements' Station, on the A. & C. R. R., in S. 1, T. 22, R. 8, W., the way lies through the pine woods of the Coal Measures, (Warrior,) after passing the outcrop of Knox Dolomite, already mentioned. The Millstone Grit and other intervening strata between the Knox and the Coal Measures, were not exposed along the route traveled.

In the vicinity of Clements' Station, numerous openings have been made for coal, some of which were visited.

At Johnson's mine, in S. 2, the seam of coal is 18 to 24 inches in thickness, in two benches separated by a few inches of shale. These numbers apply to the exposed bed at the mouth of the mine. The roof is a hard sandstone, 8 to 10 feet thick, and the floor fire clay. Above the sandstone is a thick bed of conglomerate, with pebbles sometimes as large as the end of the thumb. This rock, which is exposed in this vicinity, in all the little depressions caused by denudation by the tributaries of Lie Branch, resembles very much a conglomerate overlying some of the coal beds at Tuskaloosa.

Other openings, said to be upon the same bed as Johnson's, are those of Devereux Brown, Hardy Clements and Hewitt. About one mile further southwest is the Jones bed, and two miles beyond, the Bowen bed mentioned above. All these are on Lie Branch. Further up the

creek is the Woodel bed, and in S. 1, T. 22, R. 8, W., the R. H. Clements bed, from which place outcroppings of coal may be seen at intervals to the station.

At the present time, no work is going on at this Clements mine, though a large amount of coal has been raised here. The thickness of the seam is 39 inches, and the quality of the coal said to be very good. I believe that preparations for renewing the work are now in progress.

Across the railroad, north of the station, and within the distance of two or three miles, are likewise several coal openings, which, however, are now lying idle. On account of the caving in of the ground over the openings and the water in the pits, there was no chance to see any of the coal seams.

The beds where examined, have a very slight dip, and there seems to be no very good reason why they might not be reached by a shaft at the station, by which the expense of hauling in wagons, over rough roads, and from distances of half a mile to three or four miles, might be avoided.

At the old stage stand, about one mile from Clements' Station, are some fine springs of freestone water, known as Wheelock's Springs.

East of Clements' Station, at the intersection of the Huntsville with the Scottsville road, the chert of the Knox Dolomite is observed, but from that point to Smallwood's Station, it is generally covered by the drift. At Smallwood's, the Dolomite is the surface rock again. At Vance's Station, strata of a flaggy limestone, nearly vertical, and full of fossils, are shown in a railroad cut. East of this station, the pine woods hills are covered with a ferruginous sandstone, similar to that so common in the drift. This sandstone, in places, is rich in iron, and pieces which might be very fair samples of limonite, are not uncommon. This passage of ferruginous sandstone into limonite has already been noticed in Dibb county, near Pratt's Ferry, near Ashby Junction, &c., and other occurrences of it will be described beyond.

Northwest of the railroad, at Vance's, and within the

distance of two miles, we find the Millstone Grit well exposed. This rock is seen in two or three ledges. The first of these, nearest the railroad, stands nearly vertical, with a slight slope, however, to the southeast. Where a branch has cut through this rock, I observed, in several places, strata of yellowish shales, with surfaces coated with a thin black film. These shales, like the Millstone Grit, are almost vertical, and distant only 50 to 60 feet from it, southeast. They are probably shales of the Sub-Carboniferous formation, since similar shales have frequently been noticed occupying a similar position with reference to the Millstone Grit on both sides of the valley above this point.

Some two hundred yards northwest of the first bed of Millstone Grit is another bed of quartzose sandstone, precisely similar, and, like the first, nearly vertical, though a slight inclination was noticed towards the northwest.

At a short distance still further northwest, nearly horizontal, beds of a coarse grained quartzose sandstone are encountered, and beyond these the sandstones and shales of the Warrior field.

A few miles northeast of Vance's, very much the same exposures of rocks may be seen. The first beds of Millstone Grit, making high and precipitous cliffs, mark the limit of the valley towards the west. Below these, at the very foot of the cliffs in fact, the black and yellowish Sub-Carboniferous shales are exposed wherever a little branch has cut through the hard rim of sandstone, the shales having about the same dip as the sandstone, nearly vertical. At one point, the Knox Dolomite and the sandstone were seen in clear exposures, separated by a ravine not more than 100 yards across; the strata of the Dolomite dipping southeast, at an angle of 45° or less, the sandstone nearly vertical, say dipping 85° southeast.

In offering an explanation of these facts, we have to bear in mind that crossing from the Knox Dolomite of the valley at this point westward, instead of encountering in succession the strata of the Chazy and Trenton, Clinton, Black Shale, &c., we come from the Dolomite, in less than one

hundred yards distance, directly upon the Millstone Grit, with a few feet of Sub-Carboniferous shales exposed below it. All the strata between the Knox Dolomite and the Coal Measures, except the few feet of Sub-Carboniferous, have disappeared.

We have here a fault by which the Dolomite of the Lower Silurian has been pushed up against the rocks of the Coal Measures, thus covering the strata between. That besides the vertical displacement, there has been also a sliding of the lower Silurian rocks upon the upturned and folded back or reflexed edges of the Carboniferous strata, seems probable when we consider the difference in dip of the two sets of rocks.

This fault does not extend, however, very far towards the northeast, or at least the vertical displacement seems not to be so great, since west of Woodstock there is a well defined ridge of Clinton rocks, with accompanying red ore, between the Dolomite and the edge of the Coal Measures.

The presence of almost *horizontal* beds of hard quartzose sandstone, apparently identical with the Millstone Grit, and not more than five hundred yards west of the *vertical* beds of the latter rock, is a noteworthy fact.

These horizontal beds of sandstone are sometimes found lying bare over considerable areas. One of these, the "Eight Acre Rock," as it is called, is a bare rock, (thirty or forty acres in extent,) composed chiefly of quartz grains, with some strata of a conglomerate, with pebbles as large as peas.

Lithologically, this differs very much from the ordinary sandstones of the Coal Measures, and resembles nothing so much as the Millstone Grit near it, and with which it is no doubt identical.

This would give, at a rough estimate, over eight hundred feet in thickness to this bed.

On the "Eight Acre Rock," the beds are intersected by two sets of joints, running northeast and northwest respectively. Some of these joints have widened out into fissures of several feet, and twenty to thirty feet deep. The sur-

face of the rock has been weathered into numerous little elevations and depressions, the latter filled with white sand, support a scanty growth of a *Hypericum*, and one or two other hardy herbs. Besides these, only the prickly pear (cactus) and patches of yellow lichens obtain a hold upon the bare rock. At the western edge is a large cave, formed by a projecting ledge.

In some respects, this reminds one of the "flat rocks" of granite in the Metamorphic regions of the State.

Above Vance's, and near Mrs. Dowdell's, the Cherty Dolomite forms several rocky knobs, and in one of these is a cave with fine stalactites. The smoke of torches has blackened the surface of these, but when broken off they show handsome crystalline structure.

Above Vance's Station begin the beds of limonite, which have directed so much attention to Roup's Valley. At the intersection of the Huntsville and Columbiana roads, is one of these ore banks, of considerable extent. Between this and Bibbville, the hills are usually covered with drift, and the concretionary ferruginous conglomerate, before mentioned, is of universal occurrence.

At Bibbville, a manufactory of fire brick was an object of interest. The material for the brick is obtained from large pits close to the station. It consists—1, of a tolerably white and plastic clay; and 2, of a moderately coarse grained arenaceous deposit, made up of grains of quartz sand, held together by a clayey cement. The baked brick, when examined with the lens, resemble, to some extent, specimens of Millstone Grit, the quartz grains being a prominent ingredient.

These bricks are much used in the construction of the furnaces and rolling mills, and are highly recommended by those using them.

Near Esquire Green's, a few miles southeast of Woodstock, is a fine exposure of the Chazy limestone, in the usual characteristic ledges along a hillside. A rough measurement gave some four hundred feet thickness of the strata.

The lower beds held numerous shells of *Maclurea magna*, which seemed to be absent from the uppermost beds.

The fossils of these upper beds have more resemblance to Trenton fossils. At this outcrop, the strike is N. 26° E. and the dip S. E. 30°. Further towards the southeast come, in regular succession, the yellowish fossiliferous sandstone of the Clinton age, with its red ore; chert, with fragments of crinoidal stems, of Sub-Carboniferous age; (the Black Shale between these two formations was not noticed at this point;) Millstone Grit, and the beds of the Cahaba coal field. The Clinton and Sub-Carboniferous, with Black Shale included, are usually associated together on each side of the valley in a tolerably well defined ridge, generally lower than the ridge of Millstone Grit, though sometimes, as near Jonesborough and Birmingham, it is higher. At this point, however, neither of the formations mentioned forms a prominent ridge.

The dip at all the outcrops noticed was southeast.

Woodstock, in S. 15, T. 21, R. 6, W., is upon the central Knox Dolomite of the valley. At this place a furnace has been erected by Mr. Giles Edwards, which has not yet gone into blast. Near the furnace is an ore bank near outcrops of cherty Dolomite, showing a moderate dip 10°—15° southeast.

Caffee's Branch, which has its source not far from Woodstock, runs, for the first two miles of its course, through beds of limonite. At the head of the branch is one of the most extensive of these deposits.

Through the courtesy of Mr. Edwards, I am enabled to give an analysis of this ore, made by Dr. T. M. Drown, of Lafayette College, Easton, Pa.

Analysis of Limonite from head of Caffee's Branch.

Iron (metallic).....	50.68
Insoluble (silica, &c.)....	9.80
Sulphur.....	none
Phosphoric Acid.....	0.31—0.12 Phosphorus.
Alumina.....	3.75
Manganese.....	none

The following analyses of limonite, from near Woodstock, will fairly represent the quality of the ore at this point :

	No. 1.	No. 2.	No. 3.
Combined water.....	11.35	12.14	11.55
Siliceous matter.....	2.46	12.16	2.98
Sesquioxide of iron.....	84.46	75.04	82.83
Alumina.	0.91	0.30	1.39
Oxide of manganese.....	0.33	0.00	1.02
Lime.	0.26	0.41	trace.
Magnesia.	0.04	0.06	0.12
Phosphoric acid.....	0.58	0.00	trace.
Sulphur.	0.14	0.14	0.14
Metallic iron.	59.15	52.55	58.01
Phosphorus.....	0.25	none.	trace.

No. 1. From Tuscaloosa county, Section 9, Township 21, Range 6, west, near Woodstock Station. Analyzed by Prof. N. T. Lupton.

No. 2. Same locality, and analyst.

No. 3. " " " "

Greenpond Station, in S. 11, T. 21, R. 6, W., is near the southeastern edge of some very large limonite banks; the excellent quality of the ore will be seen by reference to the analyses below. A few hundred yards below the station a railroad cut has passed through an ore bed of considerable extent; southeast of the cut, the ore may be seen on the surface over several acres. This, I believe, is the property of Dr. Ragsdale of Greenpond, and to the same gentleman belongs another large deposit of ore, just east of Thomas' switch.

On the west side of the rail road at this place, Mr. Giles Edwards is engaged in raising ore for the Oxmoor Furnace, where it is used mixed with the red ore from the Clinton or Red Mountain strata. Mr. Edwards has erected here machinery for washing the ore, and a tram-way of one-fourth of a mile, connects his ore bank with the rail road.

Mr. Edwards has furnished me with these analyses of the ore taken from different localities on this bed, which has several acres superficial extent.

The analyses were made by Prof. Røepper, of Lehigh University.

Analyses of Limonite from Edwards' Bank, near Greenpond.

	No. 1.	No. 2.	No. 3.
Sesquioxide of Iron.....	83.89	84.25	57.46
Insoluble, (Silica, &c.)....	3.28	3.10	34.03
Water.....	12.51	13.09	8.55
Phosphoric Acid.....	trace.	trace.	trace.
Metallic Iron.....	58.75	59.00	40.24

It will be seen that No. 3 was a clayey specimen. The excessively small quantity of phosphoric acid found in all three specimens, is rather remarkable for limonites.

About one-fourth of a mile north of the station, in S. 11, at various localities in S. 2, T. 21, R. 6, west, and also in S. 35, T. 20, R. 6, west, banks of limonite, remarkable at least for their vast extent, were visited. I have, as yet, no analyses made of the ores from these localities, and, of course, can say nothing of the proportion of phosphorus contained in them, but the per centage of metallic iron would probably average 55 per cent. Hills, one hundred feet and more in height, and several acres in area, composed, to all appearance, of almost solid limonite, are not rare in this vicinity; indeed, the limonite being more resistant to denudation than the calcareous rocks with which it is associated, forms a large per centage of the hills and smaller elevations for a distance of five or six miles north-eastward. The soil upon these ore hills seems to be quite productive, and the hills desirable farming lands, if one may judge by the crops growing upon them, and especially by the tons of ore, which have been heaped up in piles, and walls, in order to prepare for the plough, small patches of ground.

Average samples of the ore from several typical localities in the vicinity of Greenpond have been collected, and the analyses of them will be presented at some future time.

In S. 15, T. 20, R. 6, west, the sandstones, &c., of the Clinton group, are found dipping southeast; these rocks hold three beds of the red ore, 7 feet, 4 feet, and 3 feet thick, respectively, and occupying about 40 feet of strata. These measurements were made by Mr. Edwards, and are given upon his authority.

Going northwest from this outcrop of Red Mountain rocks, we come within one-fourth of a mile, upon a stratum of Black Shale, followed by a ridge of bedded chert, and by one hundred and fifty to two hundred yards of dark blue calcareous shales, alternating with sandy calcareous rocks. These beds of chert and shales are Sub-Carboniferous, and dip at a high angle, 80° or more, towards the southeast. By the section above given it will be seen that they have been pushed over so that the newer beds are found *underneath* the older.

The Millstone Grit, which follows close upon the calcareous shales just mentioned, is exposed in a fine, characteristic section, where a branch of Davis' creek has cut its way through from the *Valley* into the *Mountains* of the coal measures. In this cut the rock stands nearly vertical, as was the case near Vance's, below, but passing through into the Warrior coal measures, the sandstones and shales pass rapidly into a more horizontal position, and within a mile of the vertical ledges of the Millstone grit, the rocks of the coal measures have very little dip. Near the center of S. 26, T. 20, R. 6, west, an opening has been made upon one of the lowest of the Warrior coal beds. The coal is in three benches, of about eighteen inches each, separated by two clay partings, the upper three inches, and the lower twelve inches thick.

If we compare the section across the valley here, with that at Vance's, described above, we find this difference: here the Knox Dolomite, instead of being almost in con-

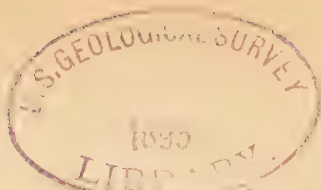
tact with the Millstone Grit, or at most, with a few hundred feet only of Sub-Carboniferous shales between, as was the case below, is succeeded by the Clinton, Black Shale, and Sub-Carboniferous beds, (the Chazy and Trenton were not noticed here, but they occur a few miles northeast.) The faulting here has therefore not been so great, or in other words the Knox Dolomite has not slid over and concealed the newer beds to the extent noticed below. If there is any displacement here, it is comparatively slight, for, though no Chazy beds were observed, they would probably be found by a closer search. The two sections have, in common, the vertical (or nearly vertical,) beds of Millstone Grit, and Sub-Carboniferous, dipping as much as 85° S. E., thus bringing the newer *under* the older rocks.

There could hardly be a clearer instance of the inversion of strata than that shown here.

Near Tannehill station we have one of the best sections across the valley. The eastern side of the anticlinal being the simpler, its geological structure will be given first, and from this the more complicated relations of the rocks on the western side may be somewhat clearer.

Tannehill station is upon the central Knox Dolomite, near its upper beds, for within one-fourth of a mile from the station going eastward we find some 350 feet in thickness of beds of the purer limestones and dolomites of the formation exposed near the bank of the creek. Some of these beds weather very smoothly, showing tolerably uniform composition—some have been quarried for lime; others are light gray dolomite, breaking with smooth conchoidal fracture. A few layers of tolerably pure blue limestone are here intercalated.

Succeeding these are beds of rough sandy dolomite with much chert, making a cherty ridge which may be seen at the upper mill; characteristic exposures of this rough cherty dolomite are found at the mill and along the bank



of the creek for a short distance. The thickness of these beds is not less than 800 feet, and the dip like that of the section above, about 50° – 52° southeast.

Limestones of the Chazy and Trenton groups come next, occupying a narrow valley between the chert ridge just noticed and the Clinton beds beyond.

The lower limestones at least, are of Chazy age, judging by the characteristic fossil *Maclurea magna*.

The dip corresponds with that of the beds below, and the thickness of the limestones is not far from 350 feet.

The Clinton strata are next encountered. These are chiefly sandstones, with shales, and two or three layers of the red fossiliferous ore. The rocks of this group form a well defined ridge at this place, or rather, taken together with the lower, cherty beds of the Sub-Carboniferous group, they form a ridge which is, however, not so marked as it becomes further northeast. The thickness of these beds is between 380 and 390 feet. The following is a more detailed section.

Beginning below, next the limestones of the preceding group, the Clinton rocks are—

1. Thin-bedded yellowish sandstones, alternating with yellowish and greenish shales.....155 feet.
2. Thick-bedded yellowish sandstones, alternating with thinner strata of the same rock... 80 feet.
3. Thin-bedded, flaggy sandstones..... 10 feet.
4. Red ore, thickness not ascertained.
5. Thin-bedded, yellowish sandstones, with some heavier layers 2-3 feet thick..... 30 feet.
6. Red ore, exact thickness not determined.
7. Heavy-bedded, yellowish or reddish sandstones 50 feet.
8. Shaly beds of greenish and yellowish colors 30 feet.
9. Shales with thin-bedded sandstones..... 25 feet.

Total thickness.....above 380 feet.

Seventy-five or eighty feet of strata were not seen (covered with soil) between No. 9 and the first of the chert beds to be described below. The Black Shale will probably be

found occupying part of this area, as it has been noticed a mile or two north of this section, between the Clinton and Sub-Carboniferous beds.

From the lower Mill down to the ridge of Millstone Grit, a fine opportunity is presented for the study of the Sub-Carboniferous rocks of this part of the Valley. They occupy an area of one-fourth of a mile or more across the strike, which would give not less than 800 feet vertical thickness. Although many of the beds are highly fossiliferous, the fossils have not as yet been studied sufficiently to enable me to give the equivalents in other states, of the beds observed here.

A section of the Sub-Carboniferous rocks at this place beginning below, at the lower mill, shows the following:

1. Heavy layers of bedded chert holding casts of crinoidal stems, and of brachiopod shells. These chert beds form the shoals upon which the dam has been built. The chert often resembles a porous friable sandstone from which calcareous matter has apparently been removed. In the chert, are subordinated beds of limestone, at least three: one of them a compact, gray, crystalline, crinoidal limestone; another, a dark blue fine grained rock.

Thickness of the cherty beds, about 200 feet.

2. Following these are at least 200 feet of calcareous strata, alternating with shales: some of these shales are black and quite fissile, others lighter colored and softer; all fossiliferous.

In this division there are two or three beds of limestone hard, compact and full of fossils; from beneath one of them issues a very fine bubbling spring, like those so common in the Knox Dolomite.

The great mass of the rocks, however, seems to be made up of impure argillaceous and sandy limestones, which weather into yellowish, brownish and reddish sandy rocks or shales—full of fossils as a general thing. These limestones, when fresh, are exceedingly hard and tough, and ring like a metal under the hammer. The dip of the beds wherever taken, was southeast, about 50° – 55° .

I might add the following section of some of the beds of

No. 2 above, given more in detail, which will serve to show some of the characteristic features of the section. These rocks are exposed in the bed of the creek below the mill, and are, beginning with the lowest, (up stream):

1. Hard gray sandy calcareous rock, weathering into shales 30 feet.
 2. Clay shales, soft, light colored..... 30 feet.
 3. Impure sandy limestone, laminated..... 8 feet.
 4. Soft, light colored clay shales..... 20 feet.
 5. Heavy bedded impure limestone, dark blue,
and weathering into a sort of sandy rock... 40 feet.
 6. Black fissile shales with numerous shells of
brachiopods..... 40 feet.
-

The old Iron Works stand in the gap cut by the waters of Romp's Creek, through the ridge of Millstone Grit, which is here exposed in a very fine section. This ridge follows, going eastward, a narrow valley occupied by the shales and calcareous rocks of the upper part of the Sub-Carboniferous section above. Beyond the iron works, eastward, is another narrow valley of Coal Measures shales, and then a considerable ridge of sandstone of the same formation.

The creek, like all others which rise in the valley, has cut through Millstone Grit, and the hard rocks of the Coal Measures. It flows into Shades Creek at no great distance from here. The first or lowest of the beds of Cahaba coal opened in this vicinity, is I think some three or four miles east or southeast of the forge.

On the opposite side of the railroad, and the northwest side of the anticlinal, we find the following:

From two and three-quarters to three miles, going across the strike, the valley is underlaid by beds of Knox Dolomite. Near the railroad, this formation has a narrow belt of impure cherty calcareous rocks, and the rest of it is almost literally an ore bank. From many localities, the

limonite has been dug to supply the old forge and other furnaces. As was the case further southwest, near Greenpond, most of the hills about Tannehill are nothing but accumulations of limonite. The ore here lies, generally, upon beds of shaly impure limestone, having the usual strike northeast, and a dip towards the southeast of 75° - 80° . It would be manifestly a tedious undertaking to enumerate all the localities of the occurrence of the ore banks, some of them, however, which were examined have some points of interest. In section 30, township 20, range 5, west, on the property of Mr. John Salmonds, are several extensive beds. In section 36, township 20, range 6, west, the association of limonite with the ferruginous sandstone already spoken of, was particularly noticed. The greater part of the loose surface fragments at this place, consisted of grains of quartz sand cemented together with limonite, which is occasionally a tolerably pure limonite with fibrous texture. The quartz grains are about the size of those of the Millstone Grit. Here, as well as at almost every other deposit in the vicinity, this ferruginous sandstone, in plates, pipes, hollow balls, &c., similar to those which almost universally cap the hills of the Drift formation further south, are found mingled with larger and smaller masses of pure concretionary limonite. I give these particulars on account of the bearing which they may have upon the origin of the limonite. The conclusion seems to be justified that whatever agencies have been at work in forming the ferruginous rocks of the Drift, have also been active in producing the similar iron rocks and ores of this formation. On this point, however, more will be said below.

At the McMath place, in section 30, township 20, range 5, west, a fine spring issues from beneath the Dolomite. In the northern part of the same section, an outcrop of Chazy limestone occurs, and a short distance further northwest a ridge of the Clinton sandstones, with two or three seams of red ore. This is followed by beds of chert, with well defined Sub-Carboniferous fossils, (the Black Shale was not seen exposed,) and about one-eighth of a mile

northwest of the chert beds, over a narrow valley of shaly rocks, probably also Sub-Carboniferous, we find the nearly vertical ledges of the Millstone Grit as usual, and beyond these the Warrior Coal Measures.

All these beds west of the anticlinal axis, dip towards the southeast, showing, as was the case further southwest, an inversion of the strata.

This occurrence of Chazy and Trenton, Clinton, Black Shale and Sub-Carboniferous beds in regular succession on both sides of the Knox Dolomite, may be seen at any cross section of the valley between Greenpond and Birmingham, and in all probability beyond, to the head of the valley.

In addition to the simple anticlinal here noticed, we find from Bucksville, northeastward, as far as Elyton, at least, in a more or less continuous ridge, a repetition of the *trio* of formations, Clinton, Black Shale and Sub-Carboniferous, and sometimes the upper beds of the Chazy and Trenton group. From Bucksville to S. 36, T. 19, R. 5, W. this doubled set of formations is found as a well defined ridge, known in the vicinity as *McShan Mountain*.

We propose now to give some details concerning this curious feature of the valley.

In Tuomey's first Report (p. 16), there is a section across the valley at Bucksville with a figure, which will serve to explain the positions of the formations as there exposed. I give below the table of the strata as given by him, together with the formations to which they belong, as ascertained by subsequent investigations.

a. b. Millstone Grit, and Coal Measures of the Warrior and Cahaba, on opposite sides of the valley.

c. Black clay slate, }
d. Cherty rocks, } *Sub-Carboniferous.* •

e. Yellowish sandstone and iron ore. *Clinton.*

f. Siliceous rocks containing stems of Crinoidea. *Sub-Carboniferous.*

g. Sandstone containing iron ore. *Clinton.*

h. Limestone. *Chazy and Trenton.*

i. Magnesian Limestone. *Knox Dolomite.*

i(bis). Limestone, (*Chazy and Trenton,*) not given in Tuomey's section, but seen east of railroad at Tannehill Station.

k. Yellow sandstone. *Clinton.*

l. Ridge of Cherty rocks. .

m. Sandstone.

n. Clay slate, underlying Millstone Grit.

} *Sub-Carboniferous.*

The section from *i.* to *n.* has already been described above, between the railroad and the Millstone Grit, at the old forge, and measurements given of the thickness of the strata. To the other half of the section, from *k.* to *c.*, I wish to call attention.

It will be seen that we have a repetition of the Clinton and Sub-Carboniferous rocks, *g.* and *f.*, and *e.*, *d.* and *c.* In Tuomey's figure, the Millstone Grit, *a.*, is represented as lying unconformably upon the slates and shales, *c.*, but I am inclined to think that in this particular, the section is faulty. In reality, the Millstone Grit stands on the western side of the valley, nearly vertical, or more correctly, it dips 85° or more towards the northwest, and the underlying Sub-Carboniferous shales have the same dip, which very gradually going westward, changes slightly to the southeast; at no point, however, being more than 5° from vertical, just as though the Millstone Grit, in the folding, had been pushed over *a little less* than the underlying rocks.

I do not think that Tuomey's explanation of the facts on p. 18 of his Report, viz: that the axis of the anticlinal is hidden beneath the Millstone Grit and Coal Measures, will hold good. The apparent unconformability of the Millstone Grit and the underlying rocks, exceedingly slight at most, can, I think, be better explained by assuming that the former being one of the upper beds of the great fold, and lying considerably to the westward of the axis of the fold, was less bent up than those beneath. Below this place, we find the Millstone Grit bent over still more, so as to slope the other way, *i. e.*, southeast, and the rocks of

the Coal Measures, which are undoubtedly conformably laid upon it, are seen a few hundred yards northwest nearly horizontal, or even dipping slightly northwest.

In a Report by Prof. J. P. Lesley, of Pennsylvania, upon the "Geological Structure of the Scott, Wise and Tazewell Counties, Virginia," there is described and figured a fault occurring in Abb's Valley, which I consider the counterpart of what may be seen in this valley, and the occurrence in such close proximity of the vertical sandstones of the Millstone Grit, and the horizontal strata of the immediately overlying Coal Measures is there explained in what seems to me the most convincing manner.

A precisely similar fault has already been noticed above, at Vance's Station, where it is exceedingly well defined. The same fault, with perhaps much less vertical displacement, occurs undoubtedly here, near Bucksville.

I am sorry that the means at my disposal are not sufficiently ample to enable me to reproduce the figure here; the reader is, therefore, referred to the paper by Prof. Lesley, above alluded to, and to the figure in Tuomey's Report, for a better understanding of what has been said.

As to the details of the doubled Clinton and Sub-Carboniferous beds at Bucksville, I can add the following: A few hundred yards northeast of the old McMath place, in S. 30, T. 20, R. 5, W., begins a ridge which, at its southwestern extremity, is covered with limonite of the Knox Dolomite. Near Bucksville, we find this ridge made up of the yellowish sandstones (holding beds of red iron ore) of the Clinton Group. Bucksville itself is near the junction of Knox Dolomite and Chazy, and the impure cherty dolomite of the former, with a large spring issuing from beneath, and the limestones of the latter can both be seen in the village and near the road. Back of the village, northwest, occurs the Clinton sandstone and iron ores, and at Bladoc's tan yard, the beds of chert of the Sub-Carboniferous with underlying Black Shale are shown in very good exposures in the bed of the branch. It seems that at this place there is even a local doubling of the Clinton

and Sub-Carboniferous interpolated beds, for we find two distinct outcrops of the red ore with bedded crinoidal chert between, in the immediate vicinity of the tan yard.

The exact details of this seeming anomaly, I was not able to get, and I merely mention this in passing. For our present purpose, it is sufficient to know that the trio, Clinton, Black Shale and Sub-Carboniferous, is found just back of Bucksville, at Bladoe's tan yard. All these rocks are nearly vertical, inclining 85 degrees, or more southeast, and this is to be remembered in connection with what will be said of their occurrence a few miles northeast of this point.

Now going northwest from Bladoe's, we pass in regular order (after the interpolated trio just described) the strata of Knox Dolomite, Chazy and Trenton, Clinton sandstones and red ore, (at this point called Red Mountain,) Sub-Carboniferous chert beds with crinoids, (Black Shale not actually observed,) and lastly, Millstone Grit.

It will be seen that this section agrees with Tuomey's, quoted above, except that the Millstone Grit is almost vertical, and not as represented in his section.

To the courtesy of Mr. Giles Edwards, I am indebted for the following analyses of the Red Ore from several localities near Tannehill. The ores are all from the western side of the valley.

	No. 1.	No. 2.
Metallic Iron.....	50.82	55.51
Silica, &c.....	17.38	10.39
Sulphur.....	none	0.08
Phosphorus.....	0.09	0.06
Alumina.....	6.06	5.37
Manganese.....	none	0.44

No. 1 was made by Mr. J. B. Britton of Philadelphia; No. 2, by Dr. Thomas M. Drown, of Easton, Pa., both well known chemists. The percentage of phosphorus in these ores is exceedingly small.

Another specimen from S. 19, T. 20, R. 5w., by Mr. A. W. Kinzie, shows the following composition :

Sesquioxide of Iron.....	71.93	
Silica, &c.....	18.60	
Water.....	0.60	
Alumina, &c.....	5.25	
Phosphoric Acid.....	0.32	= 0.14 Phosphorus.
Carbonate of Lime.....	2.86	
Metallic Iron.....	50.35	
Phosphorus in iron.....	0.28	

These analyses show that the red ore on the western side of the valley is not inferior to that on the east.

Analyses of red ores from the Eureka Mines will be found below.

Five or six miles northeast of Bucksville, in S. 36, T. 19, R. 5, W., near Mr. James Moore's, is the other end of this ridge of Clinton and Sub-Carboniferous beds, called *Mc-Shan Mountain*. The beds at this place are perfectly exposed, and a section of the northwestern side of the valley shows this order of things, viz. :

From the Knox Dolomite in the valley, going westward we come upon this ridge about a mile from the railroad. At the base of the ridge are the beds of Chazy & Trenton limestones with characteristic fossils: the beds dip 35 deg. northwest, and not southeast, as was the case at Bucksville. Going over the ridge we cross, in succession, (1) Clinton Sandstones and ore beds, making up the greater part of the mass of the ridge; the ore beds are at least two, and probably three in number; they have been tested in a few places, and yield a very excellent quality of ore; these, like the Chazy strata, dip northwest. (2) Heavy beds of chert holding crinoidal stems and other fossils of the Sub-Carboniferous: the intervening Black Shale was not observed, being covered probably with the *debris* of the other beds.

(3) A valley on the other side of the ridge in which the chert and sandy dolomite of the Quebec or Knox group appear, forming a small ridge; beyond which (4) the Chazy & Trenton limestone is found in ledges nearly vertical—but dipping 80° – 85° southeast. The upper strata of these beds are highly fossiliferous and crystalline, streaked with reddish veins. This marble is very firm, and would, if polished, show the beautiful markings which have rendered the Tennessee marble so justly celebrated.

Westward of these beds are, (5) (6) and (7), the usual trio of formations making a ridge, here called the Red Mountain, viz.: Clinton, Black Shale, and Sub-Carboniferous. The upper shaly beds of the Sub-Carboniferous are found in a narrow valley between the Red Mountain and the vertical ledges of Millstone Grit.

Nothing could be clearer than the repetition of the Chazy, Clinton, and Sub-Carboniferous beds shown by this section. The northwest dip of the repeated beds here, and their vertical position, or slight southeast leaning further south at Bucksville, are points worthy of notice.

Above this point, towards Elyton, I have noticed the same duplication of the Clinton, &c., groups, but they are not found as a distinct ridge, but only as slight elevations. Thus, near McAdory's Mill, in S. 12, T. 19, R. 5, W., there is a double outcrop of the Red ore formation; and again a short distance southwest of Elyton. The Red Mountain proper, which is at these localities a well defined ridge, separated from the Millstone Grit Cliffs by a narrow valley underlaid by Sub-Carboniferous shales, is the one farthest west. It is separated from the duplicate Red Mountain by a valley containing Chazy limestones and Knox Dolomite.

It seems that from a short distance above Bucksville, to within four miles of Elyton, the Knox Dolomite, which below Bucksville has been seen to be the most widely spread of the formations, loses its importance to some extent, and we find the limestones of the Chazy & Trenton groups in almost vertical ledges filling up a large proportion of the valley. With the decrease in the extent of the Knox strata, goes also a decrease in the number and importance

of the limonite beds. They are *not absent* in this area, but they are comparatively unimportant by the side of those extraordinary accumulations of ore in the vicinity of Tannehill, Greenpond and Woodstock.

In S. 33, T. 18, R. 4, W., near Mr. John Smith's, is an ore bank, and from that point northeast to Birmingham, extends a continuous well defined ridge of chert of Knox Dolomite age. Upon this chert ridge is the reservoir of the Birmingham water works. It seems to be in the upper part of the Dolomite; for, crossing it west of Elyton, we descend at once into a valley of Trenton or Chazy limestone.

On the eastern side of the valley between Tannehill and Jonesborough, the road passes over chert of the Knox Dolomite, and a better road could not be desired. East of Jonesborough Station, after crossing a narrow belt of Knox Dolomite, the usual rocks of the Red Mountain are found, viz.: Chazy and Trenton, Clinton and Sub-Carboniferous, (the Black Shale not seen.) At this point the red ore is of good quality apparently, and in very great quantity.

At Old Jonesborough, the rough looking dolomite of the Quebec Group (Knox Dolomite) occurs in heavy ledges, dipping from 30 deg. to 35 deg. southeast. Between that and the station, is a low flat country with occasional outcrops of a laminated argillaceous limestone, resembling Chazy, but not yet determined satisfactorily. It lies between strata of undoubted Knox Dolomite on the west (at Old Jonesborough), and beds of the same group on the east, (between the station and the Red Mountain.)

A mile or less from Jonesborough Station, on the eastern edge of the valley, occurs a fine pond spring issuing from Knox Dolomite. A dam thrown up a few feet from the source of this spring gives sufficient fall for a mill wheel a short distance below.

Above Jonesborough, as has been intimated above, the center of the valley is occupied by the nearly vertical ledges of the Chazy limestone presumably, which are seen dipping both southeast and northwest. The geological structure of the valley at this point needs further investigation, since

the position of this limestone, in the midst of the valley with Knox Dolomite on each side of it, makes its precise relations a little obscure. Four miles southeast of Elyton may be seen the top of an anticlinal in this bedded, nearly vertical limestone, where the Dolomite seems to have been pushed up through it.

Above this point the larger part of the valley is occupied by the Dolomite, the chert ridge on the west, above alluded to, being a prominent feature. East of Elyton and Birmingham, the Red Mountain becomes a very well defined ridge, and much work has been done, in places in laying bare the red ore and raising it for shipment.

At the foot of the Red Mountain, on the western slope here, some of the finest specimens of concretionary chert yet found in Alabama have been collected. These specimens, some of which are many square feet in area, show a surface full of rounded protuberances, which are composed of chert in regular concentric layers. The outer layers have, in most cases, been worn or broken off, and the laminated shells, ball within ball, are beautifully displayed.

Going from Elyton to Oxmoor, we have the following section well displayed. (1) The clay beds of the Knox Dolomite, with a chert ridge of same formation near the Red Mountain. (2) At the base of the Red Mountain an outcrop of Chazy limestone. (3) The Red Mountain with the usual sandstones, shales and ore beds of the Clinton age. (4) In, or just beyond, the gap are the thick ledges of bedded chert of Sub-Carboniferous age, followed by a level space, probably underlaid by the shales of the same group. (5) Next, the Millstone Grit, which thus forms almost a part of the Red Mountain here, being separated from it by the narrow belt of Sub-Carboniferous shales mentioned. Descending from the Millstone Grit ridge, we come (6) into the valley of Shades Creek, here wholly within the Coal Measures, and not between the Red Mountain and Millstone Grit. Shades Valley is in the shales of the Cahaba Coal Measures, between the ridge of Millstone Grit on the west, and some precipitous bluffs of sandstone

on the east. These bluffs are the broken edges of carboniferous sandstones, which hold locally great numbers of impressions of *calamites* and other coal plants.

The Millstone Grit, from near Grace's Gap, has been used by Mr. Thomas in the construction of the hearth of the Oxmoor furnace, for which purpose it is most admirably adapted. The rock thus used, contains from 97 to 99 per cent. of silica.

A section of the Clinton strata, near Oxmoor, given below, has been made by Mr. L. S. Goodrich, of Birmingham. He recognizes two distinct deposits of ore, separated by about sixteen feet of ferruginous sandstones. The uppermost of these two deposits is about two feet thick, and is not known to hold any considerable bed of ore fit for use. No analysis of the ore from this part has been made. Below the sixteen feet of sandstone underlying the first deposit, comes the workable bed, made up of seven strata of ore interbedded with thin bands of shale.

The section, beginning at the top and descending, is :

1.	No. 1. Ore.....	7 feet 3 inches
2.	Trace of shales and pebbles...	
3.	No. 2. Ore.....	8 "
4.	Shales.....	0 " 3 "
5.	No. 3. Ore.....	2 " 3 $\frac{1}{2}$ "
6.	Shale.....	0 " 0 $\frac{3}{4}$ "
7.	No. 4. Ore.....	1 " 2 "
8.	Shale.....	0 " 1 $\frac{1}{4}$ "
9.	No. 5. Ore.....	1 " 2 $\frac{1}{2}$ "
10.	Shale.....	0 " 2 "
11.	No. 6. Ore.....	0 " 11 "
12.	Shales.....	7 " 0 "
13.	No. 7. Ore.....	1 " 3 "

Below these beds are forty to sixty feet of Argillaceous sandstones, followed by limestone.

This limestone is the Trenton or Chazy, which is found underlying the Red Mountain throughout the valley.

The ores from these seven beds were carefully selected by Mr. Goodrich, and analyses of them made by Dr. Otto Wuth, of Pittsburgh, Pa. These analyses I am enabled to give through the courtesy of Mr. Goodrich. The numbers correspond to the numbers of the ore beds of the section above.

Analyses of Red Ores, from Eureka Company's Mine, five miles below Birmingham, by Dr. Otto Wuth.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.
Silicic Acid.....	16.31	31.62	32.04	31.83	31.16	31.91	16.73
Alumina.....	3.76	4.16	5.13	4.46	4.64	4.05	2.01
Peroxide of Iron.....	78.55	62.45	59.97	60.51	59.87	60.32	66.84
Lime.....	0.68	1.03					
Magnesia.....	0.21	0.34					
Phosphoric Acid.....	0.49	0.42	0.45	0.45	0.43	0.45	0.38
Sulphur.....	Trace.						
Carbonate of Lime.....							
Metallic Iron.....	54.98	43.71	41.98	42.36	41.91	42.22	46.79

The limestone of the underlying Trenton or Chazy formation has also been analyzed by the same chemist, as also a limestone from a bed in the Sub-Carboniferous series in Shades Valley.

The analyses show that these limestones are well adapted to serve as fluxes, especially No. 2, from the Sub-Carboniferous formation.

Analyses of Limestones, near Eureka Furnace, in Jefferson County, by Dr. Otto Wuth.

	No. 1.	No. 2.
Water.....	0.11	0.10
Organic Matter.....	0.07	0.06
Silicic Acid.....	2.13	5.32
Alumina.....	0.21	0.71
Peroxide of Iron.....	0.12	0.08
Carbonate of Lime.....	90.60	93.40
Carbonate of Magnesia.....	6.74	0.32
Phosphoric Acid.....	0.016	0.011

The success of the Oxmoor furnace, with coke as a fuel, has been already demonstrated. It was at this place, under the superintendence of Mr. L. S. Goodrich, that the first coke iron made in Alabama, was turned out. The coke first used here was made, I believe, from coal mined from the Gould Seam, and afterwards from the Wadsworth seam at Helena.

ECONOMIC MATERIALS.

COAL.—The coal fields of the Warrior and the Cahaba bound the valley on either side, and their distance apart is, below Birmingham, never greater than seven or eight miles. The line of the Alabama and Chattanooga railroad does not pass into the coal area on either side until below Smallwood's Station, it enters the Warrior field, through which it passes thence to Tuscaloosa. Near Clements' Station, as will be seen above, many openings have been made for coal, and from that point on to Kennedale, seven miles from Tuscaloosa, are several coal stations. Nothing but the unsettled condition of the affairs of this road has prevented an extensive business in the mining of coal along this portion of the road.

FIRE-PROOF MATERIALS.—At Bibbville is a bed of clay and sand, which is made into fire bricks.

The fire brick manufactory of Mr. Flournoy has already been mentioned in the details above. Besides the brick for ordinary grate backs, this establishment has furnished bricks for the stacks of smelting furnaces at various places, and for the puddling furnaces at Helena.

The Millstone Grit being almost pure quartz, is one of the best of fire proof materials. Some varieties of it are of course better suited to the purpose than others. It is near the A. & C. railroad in many localities, *e. g.* Vance's, Tannehill, &c., and on the South and North railroad, at Grace's Gap. This rock has been used at the Oxmoor furnace for the lining of the hearth, and for this purpose it is unequalled.

MILLSTONES.—The Millstone Grit which bounds the valley on each side, has its name from the almost universal use made of it, wherever it occurs, the world over. There are several localities on the borders of the valley where the rock has been extensively quarried for millstones, and unfinished or broken millstones are not unfrequently found in riding over the rocky ledges.

LENTICULAR OR FOSSILIFEROUS RED IRON ORE.—The “Red Mountain,” is a name which has long been current in Alabama. It is applied to the ridges of Clinton Sandstones holding beds of red iron ore, which are found on both sides of the valley, and which have been traced with very little interruption from Pratts’ Ferry, on the Cahaba, above Centerville, to the Georgia line, and beyond that into other States. In Tennessee the Dyestone ridges are the equivalents of our Red Mountain.

The quality and amount of the ore vary from place to place along these outcrops. Sometimes the admixture of siliceous material is too large; again, the ore is exceedingly pure, as may be seen from analyses given.

The ore banks of the Oxmoor furnace have been, perhaps, the best tested and explored of any in the State, and the result shows that when properly selected this ore rivals the brown ore. The quality of the iron produced at the Oxmoor furnace is now well known.

In this connection, I may once more call attention to the fact that the group of strata holding the red ore, is *duplicated* on the western side of the valley, from Bucksville, nearly to Elyton, and that the interpolated Red Mountain ridge, holds in some places, at least, where personally visited, some very excellent ore. The McShan Mountain, as this ridge is called, in the lower part of its course, is not more than a mile from the railroad, at most places.

As to the *extent* of the beds, here sliced off from the main Red Mountain, future careful explorations and measurements are required to give that accurately, and future investigations will probably, also, show exactly how such

a long strip came to be cut off from the main, and dropped or slid down to its present position.

LIMONITE OR BROWN IRON ORE.

The Knox Dolomite of the Lower Silurian, which underlies the greater part of this valley, is here, as at other points in the State, the limonite-bearing formation. Wherever it is most widely spread, there we may look for the greatest accumulations of limonite. Mere superficial extent, however, of the Knox Dolomite does not appear to be the only condition favorable to large accumulations of limonite. We saw in Talladega county, and elsewhere (Report for 1875,) that the most extensive ore-banks were generally found between the mountain ranges of Potsdam Sandstone on the west, and the Metamorphic area on the east. In other words, where the disturbances, uplifts, &c., have been the greatest, the ore-banks are most numerous and extensive. So here, the limonite banks are most abundant where we find evidences of the greatest amount of displacement of the strata.

The commonly received explanation of the origin of the limonite, viz., that it is the result of the decomposition of ferruginous limestones and dolomites, by which the calcareous portions have been gradually removed, whilst the iron collecting together, in concretionary masses, has been deposited in beds of varying extent, near the site once occupied by the original rock, seems to hold good for the ore banks, so far as they have yet been examined in Alabama.

In some parts of this valley there is evidence to show that the Knox Dolomite, and overlying rocks have been pushed up into an anticlinal fold not only of great *vertical* height, but, also, *closely pressed* together, so that the strata all stand nearly perpendicular, or all dip in the same direction. The subsequent decomposition of this great vertical thickness of ferruginous limestones, has left correspondingly large accumulations of limonite. This appears to have been the case in the lower part of the valley, be-

low Jonesborough. Above that, however, to Elyton, at least, the vertical height of the anticlinal seems to have been much less, (see details above,) and we find in this area only a few ore-banks, and these, comparatively small.

Whilst the Knox Dolomite of the Lower Silurian appears to be the original source of most of the brown ore in Alabama, the formation of the *ore-banks*, as now observed, must be ascribed to a much later period. And, in this connection, it seems to me that something may be learned from the association of Drift deposits with beds of limonite in many localities.

In Bibb county, Talladega county, and in this valley, many instances have been noticed where a ferruginous sandstone or conglomerate, formed by the cementing together by limonite, of grains of sand or pebbles of quartz, is associated with masses of limonite quite pure. The association of the two is frequently so intimate that upon one and the same specimen both are sometimes found. This ferruginous sandstone in flat layers, pipes, hollow spheres, &c., is one of the most common occurrences in the Drift, and in the cases just alluded to, other materials of the Drift, such as rolled pebbles, beds of sand, &c., are also, associated with the sandstones and limonites.

Whatever agencies, therefore, have been active in forming the ferruginous sandstones and conglomerates usually ascribed to the Drift, have also been instrumental in forming part, at least, of the limonite with which they are so intimately associated.

COOSA COAL FIELD, AND ADJACENT FORMATIONS.

GENERAL CONSIDERATIONS.

By a reference to Prof. Tuomey's Map, it will be seen that the Coosa Coal Field, as there laid down, extends no further west than the line between Ranges 1, east, and 1, west, and no further south than the upper half of Township 20.

During the summer of 1875, I noticed in several places, much further south and west than the points above mentioned, the occurrence of Sub-Carboniferous beds, as well as of sandstones and slates, which I could refer to no other formation than that of the Coal Measures.

During the past summer this section of the State was again examined, and the limits (towards the west and south,) of the Coosa Coal Field, established with some degree of accuracy from near Helena, southward to where the lower formations are covered by Drift. The map accompanying this report will show the line thus traced out.

Before going into local details it may be well to give a general section, across the strike of the strata, passing through Helena, from the Warrior Coal Field across Roup's Valley, through the Cahaba Field into that of the Coosa. In this way, perhaps, a very good general idea of the relations to each other, of these three Coal Fields may be given.

Beginning on the west with the Coal Measures of the Warrior, and going southeast, we descend, *geologically*

speaking, through the Millstone Grit, Sub-Carboniferous, Black Shale, Clinton, Trenton, and Chazy, to the Knox Dolomite, which is the lowest formation exposed in the anticlinal valley between the two fields; then *geologically ascending*, through the same series, we reach the Coal Measures of the Cahaba. Crossing this field with its numerous plications, but with its strata generally dipping southeast, we find at Helena, a fault by which the Coal Measures are cut off, and the sandstones of the Knox Group—equivalent in all probability to the Calciferous Sandstone of the northern geologists,—brought up to their level. From this fault we cross, going southeast, the Sandstone, Shale, and Dolomite of the Knox Group, then Chazy and Trenton limestones, and immediately following these, so far as has yet been made out, the chert beds and Shales of the Sub-Carboniferous formation, the Millstone Grit, and Coal Measures of the Coosa field.

Thus, whilst the Warrior and Cahaba fields are separated, in this section of the State, by a narrow anticlinal valley, with the Knox Dolomite as the lowest formation exposed, the Cahaba measures are cut off on the east by a fault bringing Knox sandstone up to the Coal; and another point to be noted, is the seeming lack of all the Upper Silurian beds, beneath the Coosa field, whilst beneath the Warrior and Cahaba fields, only a few miles westward, these Upper Silurian beds are found exceedingly well developed in the Red Mountain, geologically below the Coal Measures both of the Warrior and the Cahaba. The thickness of the Clinton strata as measured in Roup's valley at one point, is not less than 400 feet, and this may be considered as below the average thickness, for further north, the Red Mountain becomes a very well defined ridge.

This complete thinning out of Upper Silurian beds from a thickness of 400 feet and upwards, in the short distance of ten to fifteen miles across the Cahaba fields in the vicinity of Helena, is an interesting fact. Whether the same conditions hold northeastward of Helena, I am not yet able

to say, but from information derived from others,* I am inclined to think that they do.

As to the economical value of the three hundred square miles and upwards, of territory, thus found to belong to the Coal Measures, little can be said as yet. The fact, that workable beds of coal have not yet been laid bare in this area, and the occurrence in the midst of this coal field of the limestones of the underlying Sub-Carboniferous formation, would seem to speak against any great thickness of coal bearing rocks, thus far towards the southwest, still the field must be more thoroughly investigated before certain knowledge of its capabilities can be obtained.

With these preliminary general observations we may pass on to the local details.

DETAILS.

1. QUEBEC, CHAZY, AND TRENTON FORMATIONS.

At Helena the strata of Knox Sandstone and Knox Shale, on the east side of the fault by which the former has been raised to the level of the Coal Measures, are very well exposed along the South & North Alabama Railroad, and I am able to give some additional details as to thickness of the beds, &c.

The dip of the beds varies from about 62° next to the Coal Measures to 52° at the top of the Shale; these two formations show here, an aggregate verticle thickness of from 1,000 to 1,100 feet; the line of demarcation between the two, it is impossible to draw.

A section of these beds shows the following, beginning geologically below, next to the line of fault:

(1.) Sandstones, thick and thin bedded, interstratified with the gray, green, buff, brown, and chocolate colored shales, which are so characteristic of the lower parts of the Knox group, about 270 feet.

(2.) A bed of gray sandy dolomite, 10-15 feet.

(3.) Two or three heavy beds of hard gray sandstones,

forming the knoll upon which the office of the Central Iron Works stands, and forming also the greater part of the shoals upon which the dam has been built, say 50-60 feet.

(4.) Alternating beds of dolomite and shale, with perhaps some sandstone layers, mostly covered by surface soil, but showing exposed surfaces of dolomite in many places between the office and the Rolling Mill, say 150 feet.

(5.) From this point to the bottom of the Knox Dolomite which overlies the Shale, there is a succession of thin beds of calcareous sandstones and the usual handsomely colored characteristic shales, about 500 feet.

In No. (5) of the above section and about 180 feet below the top of the Shale in one of the ledges of calcareous sandstone, I found several fragments of trilobites, which have not yet been identified. The rock from which they were taken, upon a fresh fracture resembles a hard compact blue limestone, but upon a weathered surface it looks like a buff colored sandstone. Most of the thick layers in this subdivision, when a fresh fragment is broken, resemble limestones more than they do sandstones. At the outcrops however, the calcareous matter has usually been weathered out, and they present only the sandy remnant.

For the estimation of the thickness of the Knox Dolomite, just overlying the Shale near Helena, I have not the data. Crossing it, however, in the direction of the dip, *i. e.* southeast, we find about 400 yards of country underlain by rough, sandy, dolomite, and upon that an enormous accumulation of cherty beds, about a mile across, forming a well defined chert ridge which may be traced without interruption, marking the uppermost part of the Knox Dolomite, from near Helena southward by Alexander's Mill, till it is lost under the Drift below Montevallo.

East of this cherty ridge is found a narrow valley of Chazy and Trenton limestones, and then the ridge formed by the bedded fossiliferous chert of the Sub-Carboniferous formation.

An inspection of the map will show the position of the valley of Chazy and Trenton limestone which lies between

the chert ridge of the upper part of the Knox Dolomite on the west, and another chert ridge of Sub-Carboniferous age on the east.

These three formations are found in their regular order all the way southward to where they are covered by the Drift.

Some local details of these three groups of strata will come properly at this place, and in giving the details I shall begin with the lowest and describe them in ascending order.

In the Report for 1875, I described the Dolomite where it adjoined the Cahaba Coal Measures between Montevallo and Helena. At this time, therefore, I shall speak only of the upper (eastern) part of the Dolomite which is so well characterized by accumulations of chert which make a well defined piney woods ridge from Helena to below Montevallo.

West of the limestone valley at Siluria, this ridge is seen back of Dr. Tichenor's place, and at points near Siluria, some beds of brown iron ore have been discovered, but I have seen no analyses of the ore.

South of Mr. Holt's Lime Kiln and near Elliottsville, the chert turns eastward to Whiting, which is on its eastern edge. Elliottsville is upon this cherty portion of the Knox Dolomite, and at Warren's Mill, section 25, township 21, range 3, west, there is a very large funnel shaped depression, or lime sink, from which the water is pumped for the engine.

Below Whiting, on the edge of the Dolomite, considerable search has been made for workable beds of limonite. Analyses of ore from this vicinity were given in my Report for 1875.

Going southward from Elliottsville on the Montevallo road, the way is over the cherty beds and through piney woods to Mr. Moore's, in S. 35, T. 21, R. 3, W., where the red lands of a lower subdivision of the Dolomite are entered. These red lands are found continuously then southward to Montevallo, with the exception that a strip of Knox

Sandstone and Shale is found with northeast strike and southeast dip, apparently thrust up through the Dolomite. This strip (which will be more particularly described below) terminates abruptly near Mrs. Denson's, S. 2, T. 22, R. 3, W., no trace of it being found much to the northeast of this point.

If from Moore's we turn eastward by the Columbiana road, we come, about S. 36, T. 21, R. 2, W., upon the chert again, and it is found making a considerable ridge southward by Alexander's Mill, where it is also well displayed.

In going from Montevallo towards Calera, a ridge, or rather, a succession of ridges of this chert are crossed soon after leaving town, and the huge concretionary masses of the chert which have either been rolled aside in working the road, or have been left partially exposed in the road, have no doubt left a vivid impression upon every one who has driven over this way.

Spring Creek, and some other tributaries of Shoal Creek, rise on the western side of the chert, and do not break through it, but are turned southwestward below Montevallo to flow into the Little Cahaba.

South of Montevallo, the lower formations are almost entirely obliterated by the sand and pebble beds of the Drift, which cover every thing for many miles.

Returning now to Siluria, we find, east of the chert, a narrow valley in which the projecting edges of the strata of Chazy and Trenton limestones are seen like a series of low walls running parallel with the course of the valley.

Here, as at many other points where it occurs, the limestone is much used for lime burning. Maj. Wagner's and Mr. T. G. Holt's kilns, at Siluria, Mr. Reynolds' at Whiting, and Dr. Hale's, near Montevallo, are all located upon this belt, and the lime made at these points is well known in the market.

Below Siluria this belt turns eastward, then southward, and in township 22, southwestward, as shown by the map.

Buck Creek has its principal sources in this limestone cove east of Whiting, whence it follows the valley westward and northward to Pelham, where it breaks through Knox Dolomite, Shale and Sandstone, into the Cahaba coal fields, and flows into the Cahaba river. The creek makes between Siluria and Whiting, an S-shaped curve corresponding to the contour of the limestone valley, or to the chert ridge of Knox Dolomite on one side, and the chert ridge of Sub-Carboniferous on the other.

In the neighborhood of Calera is found an isolated patch of this limestone, apparently cut off from the western belt just described. It is probable, however, that the two areas have been continuous, but this continuity is hidden by the overlying Drift, south of the Selma, Rome & Dalton Railroad. If we follow the edge of the limestone formation, where it joins the Sub-Carboniferous, we find the beds of the former always dipping at considerable angles under those of the latter.

Thus, near Dr. Hale's Lime Kiln, the limestone dips southeast under the Sub-Carboniferous chert, cut through by the railroad at the "Gap of the Mountain." Crossing then going eastward, the narrow strip of Sub-Carboniferous rocks and Coal Measures, we come into the Calera limestone, which now dips northwest, north, and around to the east, always *under* the crescent-shaped ridge of Sub-Carboniferous rocks, that bounds the northern part of the Calera area. South of the Selma, Rome & Dalton Railroad the outcroppings of limestone, both of the Calera patch and of the western belt, may be followed for a mile or two, and then they are hidden by the Drift, but the numerous lime-sinks and depressions, let us infer the presence of the limestone beneath the Drift for several miles further south.

From Squire Whatley of Calera, I obtain the information that the limestone is exposed about seven miles southeast of Montevallo on the Montgomery road; this is probably the continuation of the western belt of the limestone below Dr. Hale's. Again it comes to the surface in SS. 15 and 22 of T. 24, R. 13, E., of the lower survey.

ECONOMICAL PRODUCTS.—Throughout this entire area of Chazy & Trenton rocks there are many beds of limestone which are shown by analysis to be almost pure carbonate of lime, and it is, therefore, not surprising that the Shelby lime ranks with the very best. Aside from the lime, I know of no other useful material to be derived from this formation.

I should mention, however, that *heavy spar*, or sulphate of baryta, is found in many places in the limestone, and sometimes quite pure and white, and in considerable quantity. Thus, east and north of Whiting, are several well known occurrences. This mineral is often ground up and mixed with white lead in several proportions, giving the paints known as Venice White, Hamburg White, and Dutch White.

The *limonites* of the Knox group have already been mentioned.

2. SUB-CARBONIFEROUS AND COAL MEASURES.

East of Pelham is seen a sharp ridge running nearly north and south. This ridge is formed chiefly by the heavy beds of crinoidal chert of the Sub-Carboniferous formation. It may be traced southward to Siluria, where the railroad passes through a gap in it; below Siluria it bends around towards the east, and is cut again by the railroad at Bragg's Tank, in S. 12, T. 21, R. 3, W. From Bragg's Tank it curves northward, eastward, and then southward, enclosing all of section 8, and parts of 7 and 9, of T. 21, R. 2, W., in a sort of cove which is underlaid by the limestones already described. It continues its southern trend to the lower part of township 21, where Camp Branch cuts through it. Below this, under the name of *Harkins' Ridge*, it is cut again by the railroad about S. 9, T. 22, R. 2, W.; and it may be followed thence sothwestward, by Mr. Sentill's and Squire Whatley's, to the "Gap of the Mountain," where it is cut by the Selma, Rome & Dalton Railroad. Below this it is covered almost entirely by the Drift. The

general direction of the dip of the strata is east or south-east, always *away* from the limestone valley.

Where the ridge makes a curve, the direction of the dip of course varies, but it is always *towards* the coal measures and *away* from the limestone. The occurrence at Calera will be mentioned below, after giving some details of the region just traced out.

Near Siluria, east of the cherty ridge, shales of yellowish and blackish colors, form a narrow valley of about half a mile in width, and then follow the abrupt and broken edges of the Millstone Grit, here as elsewhere, a purely siliceous rock, with quartz grains or pebbles. The ledges of Millstone Grit form a well defined ridge following all the sinuities of the chert ridge, and at the distance of about a quarter or half mile from it.

At Patton's Mill, S. 6, T. 21, R. 2, W., the ledges of the Grit strike N. 60° E. and dip N. W. at an angle of 54°. A small tributary of Buck Creek rising in the Coal Measures, breaks through the Conglomerate here, making a very narrow gorge, the sides of which are so close together that a dam of ten feet length is sufficient to confine the water for an overshot wheel 35 feet in diameter, a few yards below.

There are few scenes more worthy of the pencil of an artist than those found wherever the Millstone Grit has been broken through by a comparatively insignificant branch. The tough, hard rock, yields only enough to allow the water to pass through, making deep, narrow gorges, with towering, precipitous cliffs of sandstone on each side.

In this tributary of Buck Creek, and several others further north, the waters rise in the Coal Measures of the Coosa field, break out into the limestone valley and across it into the Coal Measures of the Cahaba.

Beyond the ledges of Millstone Grit are the shales and sandstones of the Coal Measures extending eastward nearly to the Coosa river.

The sharp curve made by the Sub-Carboniferous chert

between Siluria and Bragg's Tank, is repeated by the Millstone Grit, and we find a sharp turn in the direction of the ledge, in the corner of SS. 1 and 12, of T. 21, R. 3, W., and S. 6 and 7, T. 21, R. 2, W. This doubling back of the conglomerate forms quite a conspicuous knob at the point indicated. So also the sandstones of the Coal Measures where they turn at a corresponding sharp angle, form a high bluff of several hundred feet, known as the Stony Butte. This is near the northeast corner of S. 6, T. 21, R. 2, W.

I am informed by Dr. Tichenor that coal has been reported as found in this vicinity, about four or five miles from Siluria.

East of Whiting, Camp Branch has its source in the limestone cove spoken of, flows south parallel to the chert ridge to the lower part of the township, where it turns abruptly east, cutting through the ridge, flowing through the Coal Measures into the Waxahatchee.

The slates exposed in the bed of Camp Branch near Shelby Springs, were mentioned in my Report for 1875, but the geological position of them was not entirely evident.

It is plain however, now, that they must be referred to the Coal Measures. The coal measures between the Sub-Carboniferous ridge east of Whiting and Columbiana, were partially examined last year and many points of interest observed.

The Millstone Grit is found in its place about one quarter of a mile east of the chert ridge, then follow the sandstones and shales of the Coal Measures to Columbiana, with an exception presently to be mentioned. Characteristic of nearly all the fragments of sandstone in this area, are the brilliant crystals of quartz which cover some of the surfaces. The crystals are generally quite small.

On pages 121 and 122 of my Report for 1875, will be found conclusions reached from observations of last year, as to the extent of the Coosa coal fields towards the south and southwest, and it will be seen that the explorations of

this year, have shown that my conjectures were perfectly correct.

A strip of limestone, considered by Prof. Worthen to be of the age of the Chester Limestone, is found running through the midst of the coal field. The manner in which this underlying limestone has been brought to light through the coal measures, whether by denudation or by a fault, will be an important point to settle in forming an estimate of the probable thickness of coal bearing rocks in this field.

In township 22, below where Camp Branch cuts through it, the chert ridge is known as *Harkin's Ridge*, and its course may be seen by a reference to the map.

In S. 8, T. 22, R. 2, W., it turns abruptly, and does so, not by a continuous curve, but in a broken one, thus :



This formation of a curve by broken lines will explain the recurrence in several alternations with each other, of Sub-Carboniferous chert and Chazy limestone, noticed last year between Montevallo and Calera.

An outcrop of Millstone Grit was observed about one mile north of the S. R. & D. R. R., near this place.

If we go from the "Gap of the Mountain," where the R. R. cuts the Sub-Carboniferous ridge, towards Calera, we cross a synclinal of Coal Measures, about one mile wide, underlaid on each side by Sub-Carboniferous Chert and Chazy and Trenton Limestone.

The Chert ridge on the eastern side of this little synclinal, curves (in a broken line as described above) around towards the north and east just back of Mr. Thompson's house, then southeast by Mr. Dare's new limekiln, and finally south and southwest, enclosing thus an area of limestone about two and a half miles from east to west, and about two from north to south; the southern limit of it being, as already said, obscured by the Drift.

Immediately beyond the Sub-Carboniferous ridge are

the shales and sandstones of the Coal Measures, and a thin seam of coal about two inches in thickness, was cut through in digging a well in S. 16, T. 22, R. 2, W. (near the middle of the section). This upon the authority of Mr. Dare.

Near Mr. Thompson's house, a quarry exposes some beds of dark colored argillaceous limestone, which is fossiliferous, but from which no well defined forms have been obtained. This limestone, which has been much used as a building stone for culverts, &c., lies under about eight or ten feet of black fissile shales. The dip of the beds is towards the northeast and the strike a little northwest. They are undoubtedly Sub-Carboniferous beds, but their position, whether above or below the chert beds, I can not give with certainty. At this point they seem to be *under* the chert.

From Mr. Dare's Kiln, the chert ridge has a southwesterly direction and can be traced several miles before it is hidden by the Drift.

East of this point are found the sandstones and shales of the Coosa Coal Measures on to near Columbiana, except where interrupted by the limestone exposure near Shelby Springs.

The geological age of the slates of the Buxahatchee and neighboring streams, is thus determined with a great degree of probability, if not with certainty. I have no doubt but that they are slates of the Coal Measures, or perhaps in some cases, of underlying Sub-Carboniferous age. The close proximity of an area of metamorphic action, may serve to account for the toughness and fissile character of these slates, which have probably been themselves partially metamorphosed.

ECONOMIC MATERIALS.—Some of the impure limestone beds of the Sub-Carboniferous group, have been tested as to their fitness as material for hydraulic lime, and in the case of the limestone occurring near Siluria, it has been found to answer. Satisfactory tests on a large scale have not yet been made.

LIMONITE.—Beds of brown iron ore or limonite, have been noticed as occurring frequently upon the ridges of chert of the Sub-Carboniferous group; but so far as the analyses go the ore is worthless. In the first place it is not likely to occur in any considerable quantity, then it is too frequently largely contaminated with chert, which often has the appearance of chalk (being white and pulverulent), but the gritty feel when it is rubbed between the fingers or between the teeth, will betray it: and lastly, the per centage of phosphorus is generally unusually large. In one specimen which was analyzed by me, it reached the figure of 4 per cent., equivalent to 9 per cent. of Phosphoric acid. Other samples gave 1.9 and 2.5 per cent. Phosphorus.

Unless, therefore, the ore has been analyzed and proven to be good, a purchase would be, to say the least, a risk.

COAL.—Of the quantity or amount of the coal contained in this part of the Coosa fields, very little can be said as yet. The occurrence of coal in this region has undoubtedly been noticed, but no workable beds of it have yet been found.

Under the beds of chert in the lower part of the Sub-Carboniferous formation which lines the Coosa coal field, a bed of black or dark blue fissile shales, like many in the coal measures, is constantly found. At the Gap of the Mountain they are well shown in contact with the overlying chert beds. The thickness of the bed is not less than ten feet. Underneath a similar bed, perhaps the same, at Mr. Thompson's house at Calera, is found a dark blue argillaceous limestone.

SUMMARY OF CHEMICAL ANALYSES.

The appended summary, in tabular form, of the chemical analyses appearing in the body of the report, will be found convenient for reference.

The analyses are from various, but always trustworthy sources.

TABLE I. IRON ORES.
BROWN ORES, OR LIMONITES.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.
Water.....	.....	12.51	13.09	8.55	11.35	12.14	11.55
Insoluble, Silica, &c.....	9.80	3.28	3.10	34.03	2.46	12.16	2.98
Sesquioxide of Iron.....	.....	83.89	84.25	57.46	84.46	75.04	82.83
Sulphur.....	none.	.....	.....	.....	0.14	0.14	0.14
Phosphoric Acid.....	0.31	trace.	trace.	trace.	0.58	0.00	trace.
Alumina.....	3.75	.....	.....	.....	0.91	0.39	1.39
Manganese.....	none.	.....	.....	.....	0.33	0.00	1.02
Metallic Iron.....	50.68	58.75	59.00	40.24	59.15	52.55	58.01
Phosphorus.....	0.12	trace.	trace.	trace.	0.25	none.	trace.

No. 1. Brown ore from head of Caffee's Branch. Analyzed by Dr. T. M. Drown.

No. 2. Brown Ore, from Edward's Bank, near Greenpond. Analyzed by Prof. Roepper.

No. 3. Brown Ore, from another part of same property as No. 2. Same analyst.

No. 4. Brown Ore, locality same as Nos. 2 and 3. Same analyst.

No. 5. Brown Ore, near Woodstock Station, Tuscaloosa county. Analyst, Prof. N. T. Lupton.

No. 6. Brown Ore, near Woodstock Station, Tuscaloosa county. Same analyst.

No. 7. Brown Ore, near Woodstock Station, Tuscaloosa county. Same analyst.

TABLE II. IRON ORES.

RED HEMATITES.

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10
Water.....										0.60
Silica, &c.....	16.31	31.62	32.04	31.83	31.16	31.91	16.73	17.38	10.39	18.60
Alumina.....	3.76	4.14	5.13	4.46	4.64	4.05	2.01	6.06	5.37	5.25
Sesquioxide of Iron	78.55	62.45	59.97	60.51	59.87	60.32	66.84			71.93
Lime.....	0.68	1.03								
Carbonate of Lime.....										2.86
Magnesia.....	0.21	0.34								
Phosphoric Acid.....	0.49	0.42	0.45	0.45	0.43	0.45	0.38			0.32
Sulphur.....	trace							none	0.08	
Metallic Iron.....	54.98	43.71	41.98	42.36	41.91	42.22	46.79	50.82	55.51	50.35
Phosphorus.....								0.09	0.06	0.28

Nos. 1 to 7 inclusive, are Red ores from seven distinct beds of ore worked at the Eureka Company's Mine, near Birmingham. Analyst, Dr. Otto Wuth, of Pittsburgh.

No. 8. Red ore from the western side of the valley, near Tannehill. Analyst, Mr. J. B. Britton, of Philadelphia.

No. 9. Red ore from near the locality of No. 8. Analyst, Dr. T. M. Drown, of Easton, Pa.

No. 10. Red ore from S. 19, T. 20, R. 5, west, western side of the valley, near Greenpond. Analyst, Mr. A. W. Kinzie.

TABLE III. LIMESTONES.

	No. 1.	No. 2.
Water.....	0.11	0.10
Organic Matter.....	0.07	0.06
Silicic Acid.....	2.13	5.32
Alumina.....	0.21	0.71
Sesquioxide of Iron.....	0.12	0.08
Carbonate of Lime.....	90.60	93.40
Carbonate of Magnesia.....	6.74	0.32
Phosphoric Acid.....	0.016	0.011

No. 1. Trenton Limestone, near Eureka mines, six miles from Birmingham. Analyst, Dr. Otto Wuth.

No. 2. Sub-Carboniferous Limestone, near Eureka Mines. Analyst, Dr. Otto Wuth.

FAUNA OF ALABAMA.

FRESH WATER AND LAND SHELLS.

There is no State in the Union that affords a more diversified Molluscan Fauna than is found within the limits of Alabama. While exhibiting no marked superiority in the number of species that are classed as Land Shells, and possibly displaying a meager list of aquatic pulmonates, it is remarkably rich in fresh water bivalves (Unionidæ), and in an operculate class of aquatic univalves, chiefly of the family Melanidæ.

The list of species here presented is compiled from various sources, chiefly the writings of Isaac Lea, L. L. D., who has written more on the fresh water shells of North America than all other original writers together. The compilations and writings of Mr. W. G. Binney have afforded much aid in compiling the pulmonate species. The writings of Thomas Say and other distinguished American Conchologists, have also been consulted.

The verification of facts relative to local and geographical distribution, has been greatly aided by material presented by various gentlemen, who have, at different times, collected shells in various parts of Alabama. Among the gentlemen to whom the greatest credit is due for specimens and notes on Geographical Distribution, may be mentioned Dr. E. R. Showalter, of Mobile, formerly of Uniontown, who, prior to 1861, was largely interested in bringing to light many species which were previously unknown. Later, Mr. Truman H. Aldrich, of Montevallo,

formerly of Selma, has taken up the subject and afforded much valuable information. At Tuscumbia, L. B. Thornton, Esq., and Mr. B. Pybas have made many useful discoveries. At Tuscaloosa, Dr. Eugene A. Smith, State Geologist of Alabama, has recently made additions to the subject. There are, no doubt, portions of the State that have not been explored, and very likely unknown species remain to be brought to light. The shells of the Chattahoochee River, and of streams in the eastern part of Alabama were very diligently studied prior to 1861, by Dr. Hugh M. Neisler, Mr. Garrett Hallenbeck and Wm. Gesner, at Columbus, Ga. The late Rt. Rev. Stephen Elliott, of Savannah, Ga., also materially aided in contributions to our knowledge of the shells of Alabama, Georgia and other Southern States. A study of the shells of Alabama necessarily involves a portion of the fauna of Georgia and other States on the borders of Alabama. To isolate them in cases in which there is a doubt as to the extent of Geographical Distribution is sometimes difficult. Species may have been credited to Alabama that may hereafter not be verified. Unquestionably a few species that were referred to Georgia at the time they were described, will hereafter also be found in Alabama, though not so recorded here.

The fascinating character of the study of this branch of Natural History will assuredly bring new collectors into the field, and bring to light many new facts which at some future time will make a revision of the present list necessary.

JAMES LEWIS.

Mohawk, N. Y., October 24th, 1876.

Shell-bearing Mollusca of Alabama.

LAMELLIBRANCHIATA.

CONCHIFERA.

Family Unionidæ.

GENUS UNIO, Brug.

- U. abacus, *Haldeman*. Tennessee drainage.
- “ acutissimus, *Lea*. Alabama river ; Coosa river.
- “ *Æsopus*, *Green*. Tennessee drainage.
- “ alatus, *Say*. “ “
- “ altilis, *Conrad*. Alabama river.
- “ amœnus, *Lea*. Tennessee drainage.
- “ Andersonensis, *Lea*. “ “
- “ Anodontoides, *Lea*. Chattahoochee and Alabama rivers ; Bogue Chitto Creek.
- “ appressus, *Lea*. Tennessee drainage.
- “ aquilus, *Lea*. Chattahoochee or its tributaries.
- “ arcæformis, *Lea*. Tennessee drainage.
- “ arctatus, *Con*. Black Warrior, Coosa and Cahawba rivers.
- “ arcus, *Con*. Alabama river.
- “ argenteus, *Lea*. Tennessee drainage.
- “ asper, *Lea*. Alabama river.
- “ asperatus, *Lea*. Alabama and Coosa rivers ; Cahawba river ; Buck creek.
- “ atro-costatus, *Lea*. Alabama and Coosa rivers ; Cahawba river.
- “ atro-marginatus, *Lea*. Chattahoochee river.

- U. *basalis*, *Lea*. Carter's creek, (Ga.)
 " *bellulus*, *Lea*. Tennessee drainage.
 " *biemarginatus*, *Lea*. " "
 " *Bigbyensis*, *Lea*. " "
 " *Binneyi*, *Lea*. "Alabama." (Lea.)
 " *Blandianus*, *Lea*. Coosa river.
 " *Boykinianus*, *Lea*. Alabama, Chattahoochee and Coosa rivers; Buck creek.
 " *brevidens*, *Lea*. Tennessee drainage.
 " *Brumbyanus*, *Lea*. "Warrior river."
 " *cælatus*, *Conrad*. Tennessee drainage.
 " *Cahabensis*, *Lea*. Cahawba river.
 " *camelopardilis*, *Lea*. Tennessee drainage.
 " *camelus*, *Lea*. " "
 " *camptodon*, *Say*. Coffee creek and Big Prairie creek.
 " *caperatus*, *Lea*. Tennessee drainage.
 " *capsæformis*, *Lea*. " "
 " *castaneus*, *Lea*. Alabama river.
 " *Chattanoogaensis*, *Lea*. Coosa and Cahawba rivers; Bogue Chitto creek.
 " *Chunii*, *Lea*. Near Selma.
 " *circulus*, *Lea*. Tennessee drainage.
 " *circumactus*, *Lea*. Tennessee drainage.
 " *Claibornensis*, *Lea*. Alabama river.
 " *Clarkianus*, *Lea*. Tennessee drainage.
 " *clavus*, *Lamarck*. " "
 " *Clinchensis*, *Lea*. " "
 " *compactus*, *Lea*. Coosa and Cahawba rivers; Buck creek.
 " *concestator*, *Lea*. Chattahoochee river.
 " *concolor*, *Lea*. Big Prairie creek; Buck creek; Cahawba river.
 " *Conradianus*, *Lea*. Tennessee drainage.
 " *consanguineus*, *Lea*. Alabama, Coosa and Cahawba rivers.
 " *Cooperianus*, *Lea*. Tennessee drainage.
 " *corneus*, *Lea*. Chattahoochee tributaries.

- U. cornutus, *Barnes*. Alabama, Coosa and Tennessee rivers.
- " corvunculus, *Lea*. Cahawba river.
- " Columbensis, *Lea*. Chattahoochee river.
- " crassidens, *Lamarck*. Alabama, Coosa and Tennessee rivers. Cahawba river.
- " crebrivittatus, *Lea*. Coosa river; Coosawattee river.
- " crudus, *Lea*. Tennessee Drainage.
- " cuneolus, *Lea*. Tennessee Drainage.
- " cylindrellus, *Lea*. "Northern Alabama," (*Lea*).
- " cylindricus, *Say*. Tennessee Drainage.
- " decisus, *Lea*. "Alabama river," (*Lea*). Bogue Chitto creek.
- " declivis, *Say*. Alabama. Shoal creek.
- " decumbens, *Lea*. "Alabama," (*Lea*).
- " denigratus, *Lea*. Chattahoochee river.
- " deviatu, *Anthony*. Tennessee Drainage.
- " discrepans, *Lea*. "Northern Alabama," (*Lea*).
- " dispar, *Lea*. Chattahoochee river; Bogue Chitto creek.
- " dolabelloides, *Lea*. Tennessee Drainage.
- " dolosus, *Lea*. Alabama and Cahawba rivers.
- " dromas, *Lea*. Tennessee Drainage.
- " ebenus, *Lea*. Alabama river.
- " Edgarianus, *Lea*. Tennessee drainage.
- " Estabrookianus, *Lea*. Tennessee Drainage.
- " excavatus, *Lea*. Alabama, Coosa, Black Warrior, and Cahawba rivers; Buck creek; Bogue Chitto creek.
- " exiguus, *Lea*. Chattahoochee river; Shoal creek.
- " extensus, *Lea*. Chattahoochee river.
- " fabalis, *Lea*. Tennessee Drainage.
- " fallax, *Lea*. Chattahoochee river.
- " fibuloides, *Lea*. Coosa river (*Showalter*).
- " flavescens, *Lea*. Black Warrior river.
- " flavidus, *Lea*. Tennessee Drainage.
- " Florentinus, *Lea*. Tennessee Drainage.
- " foliatus, *Hildreth*. Tennessee river.

- U. *Foremanianus*, *Lea*. Coosa and Cahawba rivers; Buck creek.
- " *Forsheyi*, *Lea*. Big Prairie creek.
- " *fraternus*, *Lea*. Chattahoochee river; Cahawba river?
- " *fucatus*, *Lea*. "Northern Alabama," (*Lea*). Tusculumbia.
- " *fumatus*, *Lea*. Chattahoochee tributaries.
- " *Gerhardtii*, *Lea*. Cahawba river; Buck creek. (*Querie*, *Spillmanii*?)
- " *germanus*, *Lea*. Coosa river.
- " *Gesnerii*, *Lea*. Uchee creek.
- " *gibbosus*, *Barnes*. Tennessee river.
- " *glandaceus*, *Lea*. Cahawba river; Buck creek.
- " *glans*, *Lea*. Tennessee drainage.
- " *Gouldii*, *Lea*. "Tuscaloosa," (*Lea*).
- " *gracilis*, *Barnes*. Tennessee drainage.
- " *granulatus*, *Lea*. Big Prairie creek; Coosa river.
- " *Greenii*, *Conrad*. Black Warrior river.
- " *Hallenbeckii*, *Lea*. Chattahoochee tributaries.
- " *Hanleyianus*, *Lea*. Coosawattee river.
- " *Hartmanii*, *Lea*. Coosa river.
- " *Haysianus*, *Lea*. Tennessee drainage.
- " *Holstonensis*, *Lea*. Tennessee drainage.
- " *incrassatus*, *Lea*. Chattahoochee river.
- " *inflatus*, *Lea*. Alabama river.
- " *infucatus*, *Conrad*. Chattahoochee river.
- " *instructus*, *Lea*. Cahawba river; Buck creek.
- " *intercedens*, *Lea*. Chattahoochee river.
- " *intermedius*, *Conrad*. Tennessee river.
- " *interventus*, *Lea*. Cahawba river.
- " *irroratus*, *Lea*. Tennessee drainage.
- " *Johannis*, *Lea*. Coosa river (*Showalter*).
- " *Kleinianus*, *Lea*. Chattahoochee river.
- " *late-costatus*, *Lea*. "Tuscaloosa," (*Lea*).
- " *Lawii*, *Lea*. Tennessee drainage.
- " *Lesueurianus*, *Lea*. Tennessee drainage.
- " *lens*, *Lea*. Tennessee drainage.
- " *Lewisii*, *Lea*. Coosa river.

- U. lienosus, *Conrad*. Creeks—Bogue Chitto creek.
- “ limatus, *Conrad*. Uchee Bar (Chattahoochee river).
(Lea, X 43.)
- “ ligamentinus, *Lamarck*. Tennessee river.
- “ lineatus, *Lea*. Chattahoochee river.
- “ linguæformis, *Lea*. Chattahoochee river.
- “ litus, *Lea*. Cahawba river; Buck creek; Shoal creek.
- “ luridus, *Lea*. Coosawattee river.
- “ medius, *Lea*. Coosa river.
- “ Meredithii, *Lea*. Spring creek, Tuscumbia. (Thorn-
ton.)
- “ metanever, *Raf*. Alabama, Coosa and Tennessee riv-
ers.
- “ Mississippensis, *Con*. Coffee creek.
- “ modicellus, *Lea*. Connesauga river and Chattanooga.
- “ modicus, *Lea*. Chattahoochee river.
- “ monodontus, *Say*. Tennessee river.
- “ Mooresianus, *Lea*. Tennessee river.
- “ multiradiatus, *Lea*. Tennessee river.
- “ mundus, *Lea*. Tennessee river.
- “ Nashvillensis, *Lea*. Beech creek; Shoal creek.
- “ negatus, *Lea*. Big Prairie creek; Bogue Chitto creek.
- “ neglectus, *Lea*. “Northern Alabama,” (Lea).
- “ nigellus, *Lea*. Chattahoochee river.
- “ nucleopsis, *Conrad*. Coosa river (Showalter).
- “ nux, *Lea*. Alabama river; Buck creek; Cahawba riv-
er; Shoal creek.
- “ obesus, *Lea*. Chattahoochee river.
- “ obtusus, *Lea*. Chattahoochee river.
- “ obuncus, *Lea*. Tennessee drainage.
- “ ornatus, *Lea*. “Alabama”? (Lea).
- “ ovatus, *Say*. Tennessee river.
- “ pallescens, *Lea*. “Tuscaloosa,” (Lea.)
- “ pallidofulvus, *Lea*. Cahawba river.
- “ parvulus, *Lea*. Coosa river.
- “ parvus, *Barnes*. Tennessee drainage.
- “ paulus, *Lea*. Chattahoochee river; Beech creek.
- “ pellucidus, *Lea*. Chattahoochee river.

- U. penicillatus*, *Lea.* Chattahoochee river.
 " *penitus*, *Conrad.* Alabama river ; Coosa river.
 " *perovatus*, *Conrad.* "Green county," (Conrad).
 " *perovalis*, *Conrad.* Alabama river.
 " *perpastus*, *Lea.* Coosa river.
 " *perpictus*, *Lea.* Tennessee drainage.
 " *perplexus*, *Lea.* Tennessee drainage.
 " *perradiatus*, *Lea.* Tennessee river.
 " *phaseolus*, *Hildreth.* Tennessee river.
 " *placitus*, *Lea.* "Alabama," (Lea).
 " *plancus*, *Lea.* Coosa and Cahawba rivers.
 " *planicostatus*, *Lea.* Tennessee drainage.
 " *planior*, *Lea.* Tennessee drainage.
 " *plenus*, *Lea.* Tennessee river ; Alabama river.
 " *porphyrius*, *Lea.* Coosa river.
 " *Postellii*, *Lea.* Chattahoochee river.
 " *Prattii*, *Lea.* Chattahoochee river.
 " *propinquus*, *Lea.* Tennessee river.
 " *pudicus*, *Lea.* "N. Alabama," (Lea).
 " *pullatus*, *Lea.* Chattahoochee river.
 " *pulvinulus*, *Lea.* Coosawattee river ; Tuscaloosa.
U. purpuratus, *Lamarck.* Alabama river ; Coosa river ;
 Bogue Chitto creek.
 " *pustulosus*, *Lea.* Tennessee river.
 " *Pybasii*, *Lea.* Tennessee drainage ; small streams ;
 Coosa river ; Shoal creek.
 " *pyramidatus*, *Lea.* Tennessee and Alabama rivers ;
 Coosa river (Showalter).
 " *pyriformis*, *Lea.* Chattahoochee river.
 " *quadratus*, *Lea.* Chattahoochee river or tributaries.
 " *radians*, *Lea.* Cahawba river.
 " *radiosus*, *Lea.* Tennessee river.
 " *Raeensis*, *Lea.* Chattahoochee river.
 " *Rangianus*, *Lea.* Tennessee river.
 " *recurvatus*, *Lea.* " " "
 " *Roswellensis*, *Lea.* Chattahoochee river.
 " *rubellinus*, *Lea.* Coosa river ; Cahawba river ; Shoal
 creek.

- U. rubellus*, *Con.* Black Warrior river.
 “ *rubidus*, *Lea.* Coosa river and Big Prairie creek.
 “ *Rumphianus*, *Lea.* Coosa and Cahawba rivers.
 “ *rutilans*, *Lea.* Chattahoochee river ; Shoal creek.
 “ *salebrosus*, *Lea.* Chattahoochee or tributaries.
 “ *saxeus*, *Conrad.* Alabama river.
 “ *scitulus*, *Lea.* Spring creek, Tuscumbia.
 “ *securis*, *Lea.* Tennessee river ; Alabama river.
 “ *Showalterii*, *Lea.* Coosa river.
 “ *simplex*, *Lea.* Black Warrior river.
 “ *simulans*, *Lea.* Cahawba river.
 “ *Sloatianus*, *Lea.* Chattahoochee river.
 “ *Sowerbyanus*, *Lea.* Tennessee river.
 “ *sparsus*, *Lea.* “ “
 “ *sparus*, *Lea.* Shoal Creek.
 “ *sphæricus*, *Lea.* Alabama river ; Cahawba river.
 “ *stabilis*, *Lea.* Coosa river.
 “ *stapes*, *Lea.* Tennessee river.
 “ *Stewardsonii*, *Lea.* “ “
 “ *stramineus*, *Conrad.* Uchee and other creeks ; Beech creek.
 “ *striatus*, *Lea.* Chattahoochee river.
 “ *strigosus*, *Lea.* Chattahoochee or tributaries.
 “ *subangulatus*, *Lea.* Chattahoochee river ; Buck creek ; Shoal creek.
 “ *subellipsis*, *Lea.* Chattahoochee river ; Buck creek ; Shoal creek.
 “ *subgibbosus*, *Lea.* Coosa river ; Alabama river.
 “ *subglobatus*, *Lea.* Tennessee river.
 “ *sublatus*, *Lea.* Uchee bar ; Buck Creek ; Cahawba river ; Shoal creek.
 “ *sudus*, *Lea.* Chattahoochee river.
 “ *Taitianus*, *Lea.* “ Alabama river.”
 “ *tenuissimus*, *Lea.* Tennessee river.
 “ *tetralasmus*, *Say.* Creeks.
 “ *Thorntonii*, *Lea.* Tennessee river.
 “ *tortivus*, *Lea.* Chattahoochee river.
 “ *trapezoides*, *Lea.* Alabama river.

- U. triangularis*, *Barnes*. Tennessee river.
 " *trinacrus*, *Lea*. Coosa river.
 " *Troschelianus*, *Lea*. Coosawattee river.
 " *turgidulus*, *Lea*. Florence.
 " *tuberculatus*, *Barnes*. Big Prairie creek; Cahawba river.
 " *tumescens*, *Lea*. Tennessee river.
 " *Tuscumbiensis*, *Lea*. " "
 " *umbrans*, *Lea*. Shoal creek.
 " *umdulatus*, *Barnes*. Tennessee river.
 " *unicolor*, *Lea*. Tuscaloosa.
 " *vallatus*, *Lea*. Bogue Chitto creek; Buck creek; Cahawba river.
 " *verrucosus*, *Barnes*. Tennessee river.
 " *verus*, *Lea*. Cahawba river; Buck creek.
 " *verutus*, *Lea*. Chattahoochee river.
 " *vibex*, *Conrad*. Black Warrior river.
 " *virescens*, *Lea*. Tennessee drainage; Spring creek, Tuscumbia; Beech creek.
 " *viridans*, *Lea*. Chattahoochee river.
 " *viridiradiatus*, *Lea*. Big Uchee creek.
 " *zig zag*, *Lea*. Alabama river. [Querie, *donaciformis* Lea?]

Genus MARGARITANA, *Schum*.

- M. Alabamensis*, *Lea*. Talladega creek (Lea); Buck creek; Beech creek.
 " *complanata*, *Barnes*. Big Prairie creek.
 " *Connesaugaensis*, *Lea*. Head waters of Alabama river.
 " *Curreyana*, *Lea*. Tennessee river.
 " *Elliottii*, *Lea*. Chattahoochee river; Uchee creek.
 " *Georgiana*, *Lea*. Tributaries of Coosa river; Shoal creek.*
 " *Gesnerii*, *Lea*. Uphaupee creek.
 " *Holstonia*, *Lea*. Coosa river (abounds in streams tributary to the Tennessee river); Shoal creek.
 " *marginata*, *Say*. Tennessee river.

*[NOTE.—Possibly the shell referred to Shoal creek, as *Marg. Georgiana* may be *Holstonia*.

M. minor, *Lea*. Tennessee drainage (small streams tributary to Tennessee river.)

“ *rugosa*, *Barnes*. Tennessee river.

“ *Spillmanii*, *Lea*. Cahawba river.

“ *triangulata*, *Lea*. Chattahoochee river.

Genus *ANODONTA*, *Lamarck*.

A. edentula, *Say*. Tennessee river.

“ *Gesnerii*, *Lea*. Uphaupec creek.

“ *Hallenbeckii*, *Lea*. Uphaupec creek.

“ *Showalterii*, *Lea*. Coosa river ; Big Prairie creek.

“ *subvexa*, *Conrad*. Black Warrior river.

Family CORBICULADÆ.

Genus *CYRENA*, *Lamarck*.

C. Carolinensis, *Lamarck*. Mobile bay.

Genus *SPHÆRIUM*, *Scopoli*.

S. stramineum, *Conrad*.

S. fabale, *Prime*. Shoal creek.

S. occidentale, *Prime*. (Near Columbus, Ga.)

S. contractum, *Prime*. Grier's creek.

Genus *PISIDIUM*, *Pfeiffer*.

P. Virginicum, *Bourguignat*. Chattahoochee river.

P. abditum, *Haldeman*. Springs and small streams.

PECTINIBRANCHIATA.

Family MELANIDÆ.

Sub-Family STREPOMATIDÆ.

Genus *STREPOMA*, *Raf*.

Sub Genus *Io*, *Lea*.

Io spinosa, *Lea*. Tennessee river.

Io turrita, *Anthony*. Bridgeport. Tennessee river.

Sub Genus *ANGITREMA*, *Haldeman*.

A. angulata, *Wetherby*. Elk river. Compare *Wheatleyi* Tryon.

- A. armigera*, *Say*. Tennessee river.
 " *curta*, *Lea*. Tennessee river.
 " *lima*, *Con*. Elk river. (Compare *verrucosa*, *Raf.*)
 " *salebrosa*, *Con*. Tennessee river.
 " *subglobosa*, *Lea*. Tennessee river.
 " *Tuomeyi*, *Lea*. Tennessee river.
 " *verrucosa*, *Raf.* Tennessee river.
 " *Wheatleyi*, *Tryon*. Elk river.

Sub-genus *LITHASIA*, *Haldeman*.

- L. brevis*, *Lea*. Alabama and Coosa rivers.
L. compacta, *Anthony*. Cahawba river; Buck creek.
L. cylindrica, *Lea*. Coosa river.
L. dilatata, *Lea*. Tennessee river.
L. Florentiana, *Lea*. Florence.
L. fusiformis, *Lea*. Coosa river.
L. imperialis, *Lea*. Tusculmbia.
L. purpurea, *Lea*. Cahawba river. (See *Gon. purpurea*,
Lea.)
L. Showalterii, *Lea*. Cahawba river; Alabama river.
L. vittata, *Lea*. Coosa and Cahawba rivers.

Sub-genus *STREBHOBASIS*, *Lea*.

- S. bitæniata*, *Con*. "Black Warrior river."
S. carinata, *Lea*. "Tennessee river."
S. Clarkii, *Lea*. "Tennessee river."
S. cornea, *Lea*. Tennessee river.
S. corpulenta, *Anthony*. Tennessee river.
S. Lyonii, *Lea*. Tennessee river.
S. olivaria, *Lea*. Tennessee river.
S. plena, *Anthony*. Tennessee river.
S. solida, *Lea*. Tennessee river.

Sub-genus *TRYPANOSTOMA*, *Lea*.

- T. abruptum*, *Lea*. "Alabama," (*Lea*).
T. affine, *Lea*. Tennessee river.
T. Alabamense, *Lea*. Tennessee river.
T. alveare, *Conrad*. Tennessee river.
T. annuliferum, *Conrad*. "Black Warrior river."

- T. Anthonyi*, *Lea*. Black Warrior river, and Yellow Leaf creek.
- T. aratum*, *Lea*. "N. Alabama," (*Lea*).
- T. attenuatum*, *Lea*. Tennessee river.
- T. bicinctum*, *Tryon*. Tennessee river.
- T. bivittatum*, *Lea*. Tennessee river.
- T. Brumbyi*, *Lea*. Coosa river, and at Huntsville.
- T. canaliculatum*, *Say*. Tennessee river.
- T. canalitium*, *Lea*. Yellow Leaf creek, and Coosa river.
- T. castaneum*, *Lea*. Coosa river.
- T. Clarkii*, *Lea*. "Florence; Coosa, Cahawba, and Alabama rivers." (See Appendix.)
- T. Conradii*, *Tryon*. Numerous small streams tributary to the Coosa, Cahawba, and Alabama rivers. (See *pyrenellum*, *Con*.)
- T. curvatum*, *Lea*. Tennessee river.
- T. Currierianum*, *Lea*. Yellow Leaf creek.
- T. dux*, *Lea*. Tennessee river.
- T. excuratum*, *Conrad*. Tennessee river.
- T. filum*, *Lea*. Tennessee river.
- T. Florencense*, *Lea*. Florence.
- T. Foremanii*, *Lea*. Coosa river.
- T. gradatum*, *Anth*. "Alabama."
- T. gracile*, *Lea*. Coosa and Cahawba rivers.
- T. Hartmanii*, *Lea*. Coosa and Cahawba rivers. (Compare *prasinatum*.)
- T. hastatum*, *Anth*. "Alabama."
- T. incurvum*, *Lea*. Tennessee river.
- T. Jayi*, *Lea*. Coosa and Cahawba rivers.
- T. lativittatum*, *Lea*. "Chickasaha river, Alabama," (*Lea*).
- T. ligatum*, *Lea*. Tennessee river.
- T. Leaii*, *Tryon*. Coosa river.
- T. lugubre*, *Lea*. "Alabama."
- T. minor*, *Lea*. Tennessee river.
- T. modestum*, *Lea*. Tennessee river. Tryon, page 101.
- Obs. IX.170. (See *lugubre*, *Lea*.)

- T. moniliferum*, *Lea.* Tennessee river.
T. moriforme, *Lea.* Chattanooga. Tennessee river.
T. nobile, *Lea.* Tennessee R., Jackson Co.
T. nodosum, *Lea.* Tennessee river. "Tuscumbia."
T. olivaceum, *Lea.* Tombigbee river.
T. planogyrum, *Anth.* "Alabama."
T. ponderosum, *Anth.* Tennessee river.
T. opacum, *Anth.* "Alabama."
T. Postellii, *Lea.* Tennessee river.
T. prasinatum, *Con.* "Alabama river;" also, in the Coosa and Cahawba rivers.
T. pumilum, *Lea.* Tennessee river.
T. Pybasii, *Lea.* Tennessee river.
T. pyrenellum, *Con.* Talladega Springs; Cahawba river; Buck creek; Clear creek; Coosa river; Sulphur Spring, six miles west of Jacksonville.
T. robustum, *Lea.* Tennessee river.
T. Showalterii, *Lea.* Cahawba river; Coosa river; Tuscaloosa.
T. spinalis, *Lea.* "Alabama."
T. striatum, *Lea.* Shelby Springs; Florence.
T. Thorntonii, *Lea.* Tennessee river.
T. tortum, *Lea.* Little Uchee river. (See *lugubre*, *Lea.*)
T. trivittatum, *Lea.* Tombigbee river.
T. Troostii, *Lea.* Tennessee river.
T. Tuomeyi, *Lea.* Tennessee river.
T. univittatum, *Lea.* Cahawba R. (See *prasinatum*?)
T. venustum, *Lea.* Big Prairie creek. (See *vestitum*, *Con.*)
T. vestitum, *Conrad.* Big Prairie creek; Green county; Four Mile creek; Buck creek.
T. Wheatleyi, *Lea.* Coosa river.

Sub-genus GONIOBASIS, *Lea.*

- G. abscida*, *Anth.* "Alabama." [Abnormal, old and ex-eroded.]
G. acuta, *Lea.* N. Alabama. Tributaries of Tennessee river?
G. æqua, *Lea.* Yellow Leaf creek.

- G. Alabamensis*, *Lea.* Coosa river.
G. ambusta, *Anth.* Cahawba river. "Alabama."
G. amoena, *Lea.* "N. Alabama."
G. ampla, *Lea. Anth.* Cahawba and Coosa rivers.
G. angulata, *Anth.* Cahawba river. [var. *cinnamomea*?]
G. aretata, *Lea.* Tuscaloosa.
G. auricoma, *Lea.* Tennessee river. (*Querie instabilis*?)
G. auriculæformis, *Lea.* "Tuscaloosa."
G. baculoides, *Lea.* Coosa river.
G. basalis, *Lea.* "Alabama." (*Querie*, young of *ampla*?)
G. bellula, *Lea.* Yellow Leaf creek; Cahawba river;
 Coosa river. (*Querie*, *Lewisii*, var?)
G. Bentoniensis, *Lea.* Benton Co.
G. Binneyana, *Lea.* Coosa river.
G. Boykiniana, *Lea.* Chattahoochee river.
G. Bridgesiana, *Lea.* Cahawba river.
G. Brumbyi, *Lea.* "Alabama."
G. brunnea, *Anth.* "Alabama."
G. bullula, *Lea.* Yellow Leaf creek.
G. Cahawbensis, *Lea.* Cahawba river; Montevallo.
G. calculoides, *Lea.* Coosa river.
G. capillaris, *Lea.* Coosa river.
G. carinifera, *Lamarch.* Montevallo; Clear creek; Blount
 spring; Gadsden; Jefferson county; Sulphur spring,
 6 miles west of Jacksonville.
G. carino-costata, *Lea.* Montevallo; Talladega spring;
 Talladega; Buck creek; Calera; Shelby springs;
 Camp branch; Bowie's spring, 6 miles west of Tal-
 ladega; Cahatchee.
G. casta, *Anth.* "Alabama."
G. catenoides, *Lea.* Chattahoochee river.
G. cinnamomea, *Anth.* Cahawba river; Buck creek.
G. circincta, *Lea.* Elk river; (*querie*, banded *plicatula*?)
G. clara, *Anth.* "Alabama."
G. Clarkii, *Lea.* Gravelly springs.
G. clathrata, *Lea.* Jackson county; (very like *arachnoidea*,
 which is probably a synonym. of *acuta*.)

- G. clausa*, *Lea*. Coosa river.
G. claviformis, *Lea*. Talladega spring ; properly belonging to tributaries of Tennessee river.
G. clavula, *Lea*. Jackson county.
G. cochliaris, *Lea*. Shelby county ; [querie, *macella*?]
G. comma, *Con*. "Tributaries of Black Warrior river."
G. continens, *Lea*. Spring creek, Tuscumbia ; Buxahatchee creek, near Shelby springs ; [querie, *Pybasii*, without bands?]
G. Coosaensis, *Lea*. Coosa river.
G. corneola, *Anth*. Coosa river ; "Alabama ;" [young of *Lith. brevis*?]
G. costulata, *Lea*. Jacksonville, Calhoun county ; Sulphur spring.
G. crenatella, *Lea*. "Coosa river."
G. crispa, *Lea*. Florence.
G. cristata, *Anth*. Cahawba river ; "Alabama ;" *Anth*.
G. crebristriata, *Lea*. Tuscaloosa.
G. crepera, *Lea*. Yellow Leaf creek.
G. cruda, *Lea*. "Tennessee river."
G. culta, *Lea*. Cahatchee creek ; Coosa river.
G. cylindracea, *Con*. Black Warrior river ; "Tombigbee river."
G. DeCampii, *Lea*. Huntsville.
G. Dooleyensis, *Lea*. "Chattanooga ;" (Lea's label.)
G. Elliottii, *Lea*. Little Uchee and Uchee river.
G. ellipsoides, *Lea*. Coosa river.
G. elliptica, *Lea*. Coosa river.
G. excavata, *Anthony*. Cahawba river ; "Alabama ;" *Anth*.
G. expansa, *Lea*. "Alabama ;" Bowie's spring branch, 6 miles north of Talladega ; (no figure extant) ; the apex of the young shell is plicate.
G. fabalis, *Lea*. "Tennessee river ;" [querie, Coosa river?]
G. fallax, *Lea*. "Coosa river."
G. fascinans, *Lea*. "Yellow Leaf creek ;" Cahawba river ; Coosa river.
G. flava, *Lea*. "Benton co. ;" Talladega county ; Calera, Shelby county.

- G. flavescens*, *Lea*. Tennessee river; querie, erroneous locality?
G. formosa, *Conrad*. "N. Alabama."
G. fraterna, *Lea*. Bibb county and Cahawba river; [compare *pulcherrima*, *Anth.*].
G. fumea, *Lea*. Yellow Leaf creek.
G. furva, *Lea*. "Branch of Coosa river."
G. fuscocincta, *Anth.* "Alabama."
G. Gerhardtii, *Lea*. Montevallo; Coosa river; Turner's spring branch, 6 miles south of Talladega; Talladega.
G. germana, *Anth.* Cahawba river.
G. Gesnerii, *Lea*. Uchee river.
G. glabra, *Lea*. North Alabama; tributaries of Tennessee river.
G. glandaria, *Lea*. Coosa river.
G. Gouldiana, *Lea*. "North Alabama;" XII, 92.
G. grata, *Anth.* Big Prairie creek.
G. gravida, *Anth.* "Alabama."
G. grisea, *Anth.* "Tennessee river;" (doubtful.)
G. Hallenbeckii, *Lea*. Chattahoochee river.
G. harpa, *Lea*. "Tuscaloosa;" Coosa river; Cahawba river.
G. Haysiana, *Lea*. "Alabama;" Coosa river.
G. Hydei, *Conrad*. "Black Warrior River."
G. impressa, *Lea*. Coosa river.
G. inclinans, *Lea*. Tuscumbia.
G. inflata, *Haldeman*. Alabama river; (querie, *germana*?)
G. infuscata, *Lea*. Montevallo; "Coosa river."
G. inosculata, *Lea*. Little Uchee river.
G. intercedens, *Lea*. Montevallo; four mile creek; Bogue Chitto creek; Cahawba river; Little Mayberry creek.
G. interrupta, *Haldeman*. Buxahatchee creek.
G. interveniens, *Lea*. "North Alabama."
G. laeta, *Jay*. Coosa river; (querie, *laeta*?)
G. lævigata, *Lea*. Alabama river; Talladega springs.

- G. Lewisii*, *Lea*. "Coosa and Tallapoosa rivers."
G. lita, *Lea*. Cahawba and Coosa rivers.
G. luteola, *Lea*. Coosa river; "Alabama river;" (querie, young *Lith. brevis*?)
G. macella, *Lea*. "Coosa river;" spring at Montevallo; (Coosa river doubtful.)
G. mellea, *Lea*. Coosa river; (querie, *ampla*, half grown?)
G. nassula, *Con*. "Limestone spring at Tuscumbia."
G. negata, *Lea*. Coosa river.
G. obesa, *Anthony*. "Alabama."
G. oliva, *Lea*. "Alabama."
G. olivula, *Conrad*. "Alabama."
G. osculata, *Lea*. Coosa river.
G. ovalis, *Lea*. "Alabama;" Coosa river.
G. paula, *Lea*. Cahawba river; (see *fraterna*, *Lea*; subangulata, *Anth*.; *pulcherrima*, *Anth*.)
G. paupercula, *Lea*. "North Alabama."
G. pergrata, *Lea*. Coosa river.
G. perstriata, *Lea*. "Huntsville" and "Coosa river;" compare, *acuta*, *Lea*, and *carino-costata*, *Lea*.
G. porrecta, *Lea*. North Alabama; (essentially a Tennessee species found in creeks.)
G. procissa, *Anth*. "Alabama;" (Tryon doubts the local reference.)
G. propria, *Lea*. "Alabama;" (Coosa river?)
G. proxima, *Say*. Alabama; (see Tryon's *Strepomatidæ*.)
G. pudica, *Lea*. Alabama river; Coosa river; Yellow Leaf creek.
G. pulcherrima, *Anth*. Bibb county; [see *paula*, *Lea*; subangulata, *Anth*; *fraterna*, *Lea*.]
G. punicea, *Lea*. Alabama and Coosa rivers.
G. purpurea, *Lea*. Cahawba river; (Tryon says *rara*?)
G. pupæformis, *Lea*. Coosa river.
G. pupoidea, *Lea*. "Alabama;" Alabama, Coosa and Cahawba rivers.
G. Pybasii, *Lea*. Tuscumbia; Spring creek; (compare *continens*, *Lea*.)

- G. quadricincta*, *Lea.* Coosa and Cahawba rivers; Talladega county; Montevallo.
- G. quadrivittata*, *Lea.* Coosa and Cahawba rivers; Montevallo.
- G. rara*, *Lea.* Coosa and Cahawba rivers.
- G. rhombica*, *Anth.* "Alabama;" Cahawba river.
- G. rubicunda*, *Lea.* Coosa river.
- G. semicostata*, *Con.* Streams in North Alabama.
- G. semiquadrata*, *Reeve.* "Alabama;" (*quadrivittata* or *gerhardtii*.)
- G. Shelbyensis*, *Lea.* Yellow Leaf creek.
- G. Showalterii*, *Lea.* Coosa river; Cahawba river.
- G. simplex*, *Lea.* "Alabama;" (*Gon. virens*, *Anth.*)
- G. Smithsoniana*, *Lea.* Montevallo; Gadsden; Cave creek; Talladega springs.
- G. solidula*, *Lea.* Yellow Leaf creek.
- G. Spillmanii*, *Lea.* "Tennessee river,"
- G. straminea*, *Lea.* "Coosa river;" (querie, young of *Lith. brevis*?)
- G. strenua*, *Lea.* Benton county; Buck creek; Beech creek.
- G. subangulata*, *Anth.* "Alabama;" Nix's marble quarry, Syllacoga, Talladega county; Bibb county.
- G. sulcata*, *Lea.* Cahawba river.
- G. symmetrica*, *Hald.* "Alabama;" Daley's creek; (*Gon. imbricata*, *Anth.*)
- G. Taitiana*, *Lea.* Alabama river; Claiborn; Averitt's spring branch, s. e. part of Talladega county.
- G. tenebrovittata*, *Lea.* Shelby county; "Coosa river."
- G. tenera*, *Anth.* "Alabama."
- G. Thorntonii*, *Lea.* Tuscumbia and Florence.
- G. trochiformis*, *Conrad.* Streams in North Alabama; (querie, *Try. filum*, *Lea*?)
- G. Tuomeyi*, *Lea.* "No. Alabama."
- G. Ucheensis*, *Lea.* Little Uchee river.
- G. Vanuxemiana*, *Lea.* Alabama and Coosa rivers.
- G. varians*, *Lea.* Coosa river.
- G. variata*, *Lea.* Montevallo; Coosa and Cahawba rivers; Buck creek.

- G. Vauxiana*, *Lea*. "Coosa river."
G. venusta, *Lea*. Coosa river.
G. versa, *Lea*. "Yellow Leaf creek." Lily Shoals, Cahawba river.
G. vesicula, *Lea*. Black Warrior river. (Querie, young of *Gon. cylindracea*, *Con.*?)
G. vicina, *Anth*. "Alabama."
G. violacea, *Lewis* [MSS.] Rail Road Spring, six miles west of Jacksonville.
G. virens, *Lea*. "Alabama."
G. virgulata, *Lea*. Coosa river; Tallapoosa R. (Querie, young of *G. ampla*, *Anth.*?)
G. vittata, *Anth*. "Alabama."
G. Wheatleyi, *Lea*. Coosa river.

Sub-genus EURYCÆLON, *Lea*.

- E. Anthonyi*, *Redfield*. Tennessee river, Bridgeport.
E. crassa, *Haldeman*. Tennessee river.
E. gibberosa, *Lea*. Alabama river.
E. gratiosa, *Lea*. "Coosa river;" Alabama river.
E. lachryma, *Anth*.
E. lepida, *Lea*. "Yellow Leaf creek;" Alabama river, at Selma.
E. midas, *Lea*. Alabama and Coosa rivers. (Alabama river doubtful.)
E. nubila, *Lea*. Coosa river.
E. proteus, *Lea*. "Tuscaloosa."

Sub-genus SCHIZOSTOMA, *Lea*.

- S. Alabamense*, *Lea*. "Alabama;" Coosa river.
S. amplum, *Anthony*. Coosa river.
S. Anthonyi, *Reeve*. "Alabama."
S. Babylonicum, *Lea*. "Tuscaloosa."
S. Buddii, *Lea*. "Tuscaloosa."
S. bulbosum, *Anthony*. Coosa river.
S. cariniferum, *Anthony*. Coosa river.
S. castaneum, *Lea*. Coosa river.
S. constrictum, *Lea*. "Tuscaloosa;" Coosa river.
S. curtum, *Mighels*.

- S. cylindraceum*, *Mighels*. "Warrior river."
S. demissum, *Anthony*. ——— ?
S. ellipticum, *Anth.* Coosa river.
S. excisum, *Lea.* "Alabama."
S. glandulum, *Lea.* Coosa river.
S. glans, *Lea.* Coosa river.
S. incisum, *Lea.* "Alabama."
S. laciniatum, *Lea.* "Tuscaloosa."
S. Lewisii, *Lea.* Coosa river.
S. nuculum, *Anth.* Coosa river.
S. ovoideum, *Shuttleworth*. ——— ?
S. pagoda, *Lea.* "Tuscaloosa;" Coosa river.
S. pumilum, *Lea.* "Alabama;" Coosa river.
S. pyramidatum, *Shuttleworth*. ——— ?
S. salebrosum, *Anth.* Coosa river.
S. Showalteriana, *Lea.* Coosa river.
S. sphæricum, *Anth.* Coosa river.
S. Wetumpkaense, *Lea.* Coosa river. [Querie, var. or
young of pagoda?]
S. Wheatleyi, *Lea.* Coosa river.

Sub-genus *ANCULOSA*, *Say*.

- A. ampla*, *Anthony*. Cahawba river; Coosa river; Buck
creek; Shoal creek.*
A. contorta, *Lea.* Coosa river. [Querie, Lith. compac-
ta, *Anth.*]
A. Coosaensis, *Lea.* Coosa river.
A. Downiei, *Lea.* Coosa river. (Also found in Georgia.)
A. ligata, *Anth.* Tennessee river.
A. melanoides, *Con.* "N. Alabama."
A. picta, *Con.* Alabama, Coosa and Cahawba rivers,
A. plicata, *Con.* Black Warrior river.
A. prærosa, *Say*. Tennessee river. [Varieties are num-
erous.]
A. rubiginosa, *Lea.* "Warrior river;" Coosa river.
A. Showalterii, *Lea.* Coosa river.
A. squalida, *Lea.* "Tuscaloosa."

* In creeks a small, black variety is found.

- A. sub-globosa*, *Say*. Tennessee river.
A. tæniata, *Con*. "Alabama river;" Coosa river.
A. tintinnabulum, *Lea*. Tennessee river.
A. virgata, *Lea*. Tennessee river. (—*trilineata*, *Say*,
 var.)
A. vittata, *Lea*. Cahawba river. [This has been else-
 where erroneously credited to the Coosa river.]
A. zebra, *Anth*. "Alabama." Coosa and Cahawba rivers.
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Family VIVIPARIDÆ.

Genus VIVIPARA.

Sub-genus VIVIPARA.

- V. contectoides*, *W. G. Binney*. Tusculumbia.

Sub-genus TULOTOMA, *Haldeman*.

- T. angulata*, *Lea*. Coosa river.
T. bimonilifera, *Lea*. Alabama and Coosa rivers.
T. Coosaensis, *Lea*. Coosa river.

Sub-genus MELANTHO, *Bowditch*.

- M. ponderosus*, *Say*. Tennessee river. "All parts of the State." (*Aldrich*.)

M. ponderosus, *Say*. var. *Nolani*, *Tryon*. Coosa, Cahawba and Alabama rivers.

M. ponderosus, *Say*. (geniculate var.) Talladega creek.

M. ponderosus, *Say*. var. *coarctatus*, *Lea*. Coosa river.

M. ponderosus, *Say*. var. *incrassatus*, *Lea*. Coosa river.

M. decius, *Say*. (geniculate var.) Talladega Creek.

M. decius, *Say*. (coarctate var.) Big Prairie creek.

M. De Campi. *W. G. Binney*. Stevenson.

M. rufus, *Haldeman*. (geniculati var.) Talladega creek.

M. lima, *Anthony*. Huntsville.

Sub-genus LIOPLAX. *Troschel*.

- L. subcarinata*, *Say*. Chattahoochee river; Coosa river?

L. cyclostomatiformis, *Lea.* Coosa and Cahawba rivers;
Black Warrior river.

Family RISSOIDÆ.

Genus *SOMATOGYRUS.* *Gill.*

- S. subglobosus*, *Say.* Coosa river? Alabama river.
S. Currierianus, *Lea.* "Huntsville." Decatur.
S. parvulus, *Tryon.* Tennessee river at Bridgeport;
 Coosa river.
S. aureus. *Tryon.* Tennessee river; Cahawba river;
 Alabama river; Coosa river.

Genus *POMATIOPSIS.* *Tryon.*

P. lapidaria, *Say.*

Family NERITIDÆ.

Genus *NERITELLA.* *Humphrey.*

- N. reclivata*, *Say.* Mobile Bay? (var. *Floridana*,
 Shuttleworth.
N. Showalterii, *Lea.* Coosa river.*
-

Family HELCINIDÆ.

Genus *HELICINA*, *Lamarck.*

Sub-genus *OLIGYRA*, *Say.*

O. orbiculata, *Say.* Motevallo.

*No specimens with opercles are known. It is therefore yet uncertain if this species be a *Neritella*.

PULMONATA LIMNOPHILA.

Family AURICULIDÆ.

Sub-Family AURICULINÆ.

Genus CARYCHIUM, *Muller*.

C. exiguum, *Say*. In moist, shaded stations.

Sub-Family MELAMPINÆ.

Genus MELAMPUS, *Montfort*.

M. bidentatus *Say*. Coast marshes.

Family LIMNÆIDÆ.

Sub-Family LIMNÆINÆ.

Genus LIMNÆA, *Lamarck*.Sub-genus RADIX, *Montfort*.

R. columella, *Say*. Ponds and streams; near Selma.

Sub-genus LIMNOPHYSA, *Fitz*.

L. desidiosa, *Say*. Small streams and swamps.

L. caperata, *Say*. " " "

L. humilis, *Say*. " " " near Selma.

Genus PHYSA, *Draparnaud*.

P. gyrina, *Say*. Streams and springs.

P. elliptica, *Lea*. Streams and springs. *P. oleacea*, *Tryon*. Bridgeport.

P. crocata, *Lea*. Streams and springs.

P. Showalterii, *Lea*. Stream from Artesian well, Uniontown.

P. anatina, *Lea*. Streams.

P. Whitei, *Lea*. Streams in Georgia and Alabama.

P. pomilia, *Conrad*. "Randon's creek, near Claiborn."

Genus BULINUS, *Adanson*.

B. hypnorum, *Drap*. Swampy stations.

Genus PLANORBIS, *Guetlard*.

P. glabratus, *Say*.

Sub-genus *HELISOMA*, *Swainson*.

H. bicarinata, *Say*. Ponds and streams. Beech creek ;
Cahawba river.

H. trivolvus, *Say*. Ponds and streams.

Sub-genus *GYRAULUS*, *Agassiz*.

G. dilatatus, *Gould*. (Has been found in N. W. Georgia.)

G. parvus, *Say*. Stagnant water and small streams.

Genus *SEGMENTINA*, *Fleming*.Sub-genus *PLANORBULA*, *Haldeman*.

P. Wheatleyi, *Lea*. Swamp near Selma. (Aldrich.)

Sub-family *ANCYLINÆ*.Genus *ANCYLUS*, *Geoffroy*.

A. diaphanus, *Hald*. Tennessee river.

A. ——— ? Coosa and Cahawba rivers.

Genus *ACROLOXUS*, *Beck*.

A. filusus, *Conrad*. Black Warrior river, south of Blount
Springs ; Coosa river?

PULMONATA GEOPHILA.

Family *OLEACINIDÆ*.Genus *GLANDINA*, *Schum*.

G. truncata, *Gmelin*. Vicinity of the Gulf Coast.

Family *HELICIDÆ*.Sub-family *VITRININÆ*.Genus *MACROCICLIS*, *Beck*.

M. concava, *Say*. Wooded districts.

Genus *ZONITES*, *Montfort*.

Sub-genus *OMPHALINA*, *Raf*. [Includes *Hyalina*, *Gray*.]

O. capnodes, *W. G. Binney*. Montevallo.

O. friabilis, *W. G. Binney*.

- O. lævigata*, *Pfeiffer*. Near Selma.
O. sculptilis, *Bland*.
O. Elliotti, *Redfield*.
O. arboreus, *Say*.
O. viridula, *Menke*.
O. indentata, *Say*. Near Selma; Montevallo.
O. minuscula, *Binney*.
O. capsella, *Gould*.

Sub-genus MESOMPHIX, *Raf*.

- M. demissa*, *Binney*. Near Selma.
M. acerra, *Lewis*.
M. ligera, *Say*. Montevallo.
M. intertexta, *Binney*.

Sub-genus CONULUS, *Moq-Tand*.

- C. fulvus*, *Drap*. Near Selma; Montevallo.

Sub-genus VENTRIDENS, *W. G. Binnney*.

- V. gularis*, *Say*.
V. suppressa, *Say*.
V. lasmodon, *Phillips*.
V. interna, *Say*. Montevallo.

Sub-family HELICINÆ.

Genus PATULA, *Hald*.

- P. alternata*, *Say*. Wooded districts; near Selma.
P. perspectiva, *Say*. Wooded districts near Selma.
P. striatella, *Anth*. Wooded districts.

Genus HELIX, *Lin*.

Sub-genus HELICODISCUS, *Morse*.

- H. lineatus*, *Say*. Wooded districts; near Selma.

Sub-genus STROBILA, *Morse*.

- S. labyrinthica*, *Say*.

Sub-genus POLYGYRA, *Say*.

- P. auriformis*, *Bland*. Near Selma.
P. espiloca, *Ravenel*. Near Mobile.

- P. plicata*, *Say*. (*Helix Hazardi*, *Bland*.)
P. Febigeri, *Bland*. Near Mobile.
P. pustula, *Fer*.
P. pustuloides, *Bland*. Near Selma ; Montevallo.
P. leporina, *Gould*.

Sub-genus *STENOTREMA*, *Raf*.

- S. spinosa*, *Lea*. Near Selma.
S. labrosa, *Bland*.
S. Edgariana, *Lea*.
S. barbigeri, *Redfield*.
S. stenotrema, *Fer*.
S. hirsuta, *Say*. Montevallo.
S. maxillata, *Gould*. Near Selma ; Montevallo.
S. monodon, *Rackett*.

Sub-genus *TRIODOPSIS*, *Raf*.

- T. palliata*, *Say*.
T. obstricta, *Say*.
T. appressa, *Say*. Montevallo.
T. inflecta, *Say*. Near Selma ; Montevallo.
T. Rugeli, *Shuttleworth*.
T. tridentata, *Say*.
T. fallax, *Say*.

Sub-genus *MESODON*, *Raf*.

- M. major*, *Binney*.
M. albolabris, *Say*.
M. elevata, *Say*.
M. Clarkii, *Lea*.
M. Christyi, *Bland*.
M. exoleta, *Binney*.
M. Wheatleyi, *Bland*.
M. thyroides, *Say*. Near Selma ; Montevallo.
M. bucculenta, *Gould*. Near Selma ; Montevallo.
M. clausa, *Say*. Near Selma.
M. jejuna, *Say*.
M. Mobiliana, *Lea*.

Sub-genus VALLONIA, *Risso.**V. pulchella*, *Muller.*Genus BULIMULUS, *Leach.*Sub-genus SCUTALUS, *Albers.**S. dealbatus*, *Say.* Northern Alabama ; near Selma.Genus PUPA, *Drap.*Sub-genus PUPILLA, *Leach.**P. pentodon*, *Say.*Sub-genus LEUCOCHILA, *Alb. & Mart.**L. fallax*, *Say.**L. modica*, *Gould.**L. armifera*, *Say.* Common in cane brakes.*L. contracta*, *Say.**L. rupicola*, *Say.**L. corticaria*, *Say.*Genus VERTIGO, *Muller.*Sub-genus ISTHIA, *Gray.**I. Gouldii*, *Binney.**I. ovata*, *Say.**I. ventricosa*, *Morse.**I. milium*, *Gould.*

Family SUCCININE.

Genus SUCCINEA, *Drap.*Sub-genus SUCCINEA, *Drap.**S. luteola*, *Gould.**S. avara*, *Say.**S. obliqua*, *Say.*

APPENDIX TO THE UNIONIDÆ OF ALABAMA.

The student who may desire to become acquainted with the Unionidæ of Alabama, will naturally have his attention drawn to some interesting facts relating to Geographical Distribution. In some instances a species will be found to occur in numerous localities, some of them beyond the limits of the State. In other instances, species bearing a very close resemblance to each other occupy stations apart from each other, seldom occurring together. Many species are, so far as is known, limited to a particular stream, or a portion of a system of drainage. Among the species having widest distribution, may be mentioned *Unio Anodontoides*, which occurs in the Chattahoochee and Alabama rivers; and is also found in the Ohio river, and in some of the rivers in Illinois. A group of species very strongly resembling each other, embraces *Unio acutissimus*, *U. parvulus*, *U. rubellinus*, and *U. penicillatus*. The two latter belong also to the State of Georgia. Another group of species strongly resembling each other, varying somewhat in size and other minor details, embraces *Unio striatus*, *U. modicus*, *U. litus*, and *U. striatulus*, the last being found in North Carolina, and later (according to Mr. Lea), in Georgia.

Still another group embraces species, a portion of which are found in adjoining States, as well as in Alabama. Curiously, it appears that some of these species sometimes unquestionably occur in the same station. This group embraces *Unio decius*, *U. concolor*, *U. consanguineus*, *U. clavus*, *U. pallidofulvus*, *U. interventus*, *U. crebrivittatus*, and *U. Chattanoogaensis*. In the Chattahoochee river, *U. Sloatianus* takes the place of *U. trapezoides*, found in the Alabama

river, and in the rivers of States westward; while on the other hand, *Unio Boykinianus* is found in the Chattahoochee and Alabama rivers, and probably, also, in some of the rivers of Mississippi. *Unio obtusus*, found in the Chattahoochee, also occurs in Mississippi, while a species of similar form, *U. Claibornensis*, takes its place in the Alabama river.

Unio infucatus and *U. Kleinianus* are said to occur in the Chattahoochee river and its tributaries in Georgia, while no available record exists of their having been found in the streams rising in Alabama.

Unio lienosus, found in Mississippi and various streams in Alabama, seems to be replaced in the Chattahoochee system by three well defined species of the same group, viz: *U. concestator*, *U. intercedens* and *U. fallax*.

Unio crassidens, a robust species found in Illinois, Ohio, Kentucky, Tennessee, and also in the Alabama and Coosa rivers, in Alabama, is replaced in the Chattahoochee and Flint rivers by a nearly related species—*U. incrassatus*.

Unio camptodon (and *Unio tetralasmus*, possibly a synonym,) occurs in Ohio, as well as in Alabama, Mississippi and Louisiana. *Unio Columbensis*, of the Chattahoochee, seems to unite *camptodon* with *declivis*, forming a group.

Unio atro-costatus, which is often taken to be *U. perplicatus*, Conrad, seems to take the place of that species in Alabama. There is no reliable record that *perplicatus* occurs so far east as Alabama.

Unio Blandianus, of the Othcalooga creek in Georgia, is represented in Alabama by shells which are regarded as being *U. Rumphianus*. If the two should prove to be identical, *Blandianus* will rank as a synonym of *Rumphianus*.

Unio penitus, of the Alabama river, is replaced further east (in Alabama and Georgia) by *U. compactus*, a similar but smaller species. It is possible that both these species occur in the Coosa river; but at the present time a doubt is entertained of such occurrence.

Unio castaneus, of the Alabama river, is the analogue of *U. circulus* of Tennessee and Ohio. Specimens are some-

times seen in collections labeled *circulus*. *Unio unicolor* is probably very similar to *castaneus*.

Unio vallatus, of Bogue Chitto creek, and *U. Cahabensis*, of the Cahawba river, very strongly resemble each other.

Unio Edgarianus, of the Tennessee river and its tributaries, is the type of a group of shells resembling each other in several important particulars. *U. obuncus*, *U. Tuscumbiensis* and *U. Andersonensis* belong to this group.

Among the shells of the Alabama and Coosa rivers are a few which remain to be noted as occurring in Tennessee, Ohio, &c.; *U. metanever*, *U. cornutus*, *U. pyramidatus*, *U. securis*, and possibly *U. plenus*, may be included in this list. *Unio tuberculatus*, which occurs in Alabama, is also found in Ohio and adjoining States.

Unio subangulatus, of the Chattahoochee, is represented in Buck creek by a larger shell of the same type, which has not as yet been set apart as a distinct species. It may, however, be regarded as being quite as distinct from *subangulatus* as *medius* is from *striatus* in the Chattahoochee system.

In the Cahawba river three species are indicated, under the names *glundaceus*, *instructus* and *verus*. Specimens evidently referable to the three species have been submitted for examination. They resemble each other very strongly indeed, and differ simply as specimens of different ages and sexes might be supposed to differ, when a single species is subjected to a diversity of conditions.

The student will find that quite a considerable number of species originally quoted as found in various streams in Georgia, have been catalogued as Alabama shells. Among these is *Unio radians*, originally found in the Othellooga creek in Georgia. Shells from Alabama agreeing very exactly with the description and figure of this species have been submitted for examination. The shells that have been examined are, without doubt, the female forms of an Alabama species called *U. plancus*. The question of the identity of *radians* and *plancus* is still an open one, in the absence of Georgia specimens for comparison.

In the tributaries of the Chattahoochee river occur several species which belong to the "*complanatus* group"—a group which includes a large number of species, of which *Unio complanatus* is a familiar type. This group of shells prevails in the rivers of the Atlantic slope, and very few members of this group occur west of the Chattahoochee drainage. A single instance may possibly present itself in a species known as *Unio sublatus*, specimens of which have been found at or near Montevallo. It is possible, however, that *sublatus* really belongs to a group of which *U. gibbosus* is almost the sole type, (*Unio subgibbosus* being the exception.) The specimens referred to have the peculiar dark nacre and the singularly undulated breaks of *U. gibbosus*, though differing from that species in the form of the teeth, and in the details of the muscular and palleal cicatrices.

There remain abundant suggestions which might possibly be profitably added, but as this would necessarily involve much *descriptive matter*, it is deemed expedient to refer the student to the published writings of Isaac Lea, LL. D., in which will be found descriptions of a very large share of the Mollusca of North America, with usually very fine illustrations. The writings of Thomas Say, Mr. T. A. Conrad, Mr. John G. Anthony, Dr. Barnes, Hildreth, and others, might also be read with advantage.

Notes on CORBICULADÆ.

Cyrena Carolinensis is found on the Atlantic coast as far North as South Carolina. It occurs also on the west coast of Florida, and has been tabulated here on the presumption that it will unquestionably be found in Mobile Bay.

Shells referable to *Sphaerium stramineum*, found in Alabama, are quite unlike any thing from other States that have been presented as that species.

A single specimen, only, of *S. jabale* is all that has been presented from Alabama.

Sphaerium occidentale was found prior to 1860 in a swamp near Columbus, Ga.; whether in Alabama or Georgia is unknown. It will undoubtedly be found in similar situations in Alabama.

Pisidium Virginicum is found in numerous rivers in the United States, and undoubtedly will be found in muddy portions of some of the rivers of Alabama.

APPENDIX TO STREPOMATIDÆ.

The Strepomatidæ of Alabama seem to be divided into three great groups. The first is characterized by the presence of the genera *Io* and *Angitrema*, which are locally restricted in this State to the Tennessee Drainage, in which they occur with a preponderating number of species of *Trypanostoma*, a smaller number of species of *Anculosa* and *Strephobasis*, and comparatively a few species of *Goniobasis*.

In the Alabama system of drainage comprising the Tombigbee, Black Warrior, Alabama, Calawba, and Coosa rivers, and their tributaries, are found a less considerable number of species of *Trypanostoma*, a single species of *Strephobasis*, several species of *Anculosa*, and a preponderating number of species of *Goniobasis*. The characteristic genus of this system of drainage is *Schizostoma*, which includes a considerable number of recognized species. It is believed that this genus is confined to the Coosa river. Doubts, however, are suggested on that point by the fact that several of the earlier species brought to notice were credited to "Tuscaloosa," and the "Warrior river." No recent information on this point affords any means of settling the doubts, though it is hoped that explorations now under contemplation may bring to light conclusive testimony relative to the distribution of *Schizostoma*.

In the Chatahoochee river and its tributaries, have been found only a few species of *Goniobasis*, and possibly a single species of *Trypanostoma*.

In the original descriptions of some of the species of *Trypanostoma*, and *Goniobasis*, found in the State of Alabama,

localities have been assigned that identify some of the species of the Tennessee system of drainage with certain forms found in the Alabama system. A careful examination of these supposed cases of identity of species in the two systems of drainage has not as yet elicited any confirmatory evidence. It seems, indeed, very probable, that not a single instance of supposed identity will be verified. In explanation, it may be remarked that collectors are *not* always careful to keep apart from each other their unidentified specimens of species from various localities, and it is not an uncommon circumstance for specimens to pass into the hands of the descriptive naturalist with local references of an unreliable character. This, together with the vague and very indefinite mention of the *State* or *Continent* for the *locality* of a species, is surely the source of continual trouble to one who seeks to reconcile his shells with the literature relating to them.

While the preliminary sheets of this paper were in progress, the writer was urgently solicited to embody in it such facts in synonymy as might be thought useful. In reply to these solicitations it may be urged that there is not yet at hand, and may not be for many years to come, a sufficient amount of material to enable the most careful student to do justice to the subject, and not at the same time do injustice to those writers who have done most to define species.

A few of the difficulties of synonymy may be presented in a manner which will be appreciated by those persons who have given the subject slight attention. Take, for instance, some common and well known species of *Trypanostoma*, found in the Tennessee river. On tracing it from point to point along the stream it will be found to vary in several particulars, which are obvious at a glance. If only the *extreme forms* are known, these would appear to the observer to differ so much from each other as to justify him in regarding them as distinct species—an opinion he is compelled to abandon when further investigation has brought to light the intermediate forms. There may be,

and undoubtedly there are species, (as in the family Unionidae,) in which the sexes are distinguishable from each other by certain peculiarities of form and size. This is a portion of the subject which has not yet been investigated, and really nothing is known relative to it. There are unquestionably instances in which *hybrids* occur. These, except under very favorable conditions for observation, would be likely to be regarded as *species*.

Occasionally abnormal specimens come to the notice of the Naturalist—usually a solitary specimen (and the author “regrets there were not more,”) is all that is known, and it is recorded as a species. It sometimes happens that a species produces specimens the epidermis of which exhibits a uniform color without bands. Other specimens, on the other hand, have bands. Unquestionably, a species has been divided and put on record as *two distinct species*, with no better ground for the division than has been stated. Again, a species sometimes produces specimens characterized by several revolving elevated lines or carinæ. Mr. Say made a second species of *Gonicbasis Virginica*, based on this peculiarity; Mr. Anthony has bestowed similar attention on a variety of Mr. Say’s *Anculosa trilineata*; and a curious sequel to this is that many intelligent naturalists, who do not admit the validity of Mr. Say’s “*Melania multilineata*,” regard Mr. Anthony’s *Anculosa costata* with favor.

There are yet other perplexities, and these arise out of the diversities of forms a species is liable to manifest when developed under the varying conditions of stations unlike each other in temperature, mineral properties of the water, abundance or absence of appropriate food, the influence of light, the influence of currents in the water, and finally, other influences of equal importance, which possibly have not yet been conjectured.

The *form* of a shell is simply a function of the mantle—a delicate membrane, in which the soft parts within the shell are included, and which lines the interior of the shell and deposits the calcareous matter of which it is composed.

The *color* of a shell may, to a very great extent, depend upon that function of the mantle involved in the production of the epidermis. It may also be to some extent influenced by the properties of the water in which the mollusc lives.

It will be seen that there are numerous conditions which may affect a single species and cause it to be presented under such aspects as to create the impression that different local forms are different species. Much has been done in the direction of synonymy, but without doubt, equally as much more remains to be done. It may also be suggested that a few errors have crept into synonymy, as it is now received, and the work needs revision. In a class of shells embracing so many species, presented under the difficulties that beset the Strepomatidæ, it will be impossible to do more at present than suggest inquiries. The brief hints that occasionally appear in the list of species are all that it seems expedient to suggest at this time.

APPENDIX TO VIVIPARIDÆ.

V. contectoides is distributed over a wide extent of territory. It inhabits the rivers of Illinois and Indiana. Specimens from Illinois have been successfully colonized in New York. Very fine specimens of the species are found in Othcalooga Creek, Georgia. A variety of this species occurring in Florida, has received the name *V. Waltoni*, Tryon.

Tulotoma bimonilifera, Lea, (*magnifica*, Conrad,) is admitted by the Academy of Natural Sciences to take precedence over *magnifica*. *T. Coosaensis*, hitherto regarded as a true *Vivipara*, is unquestionably a *Tulotoma*, and is well characterized as such by its opercle. Perfect specimens are characterized by numerous short, hairy prolongations of the epidermis on a considerable portion of the surface, and more particularly by a bristly fringe to the margin of the aperture.

Melantho ponderosus, Say, which occurs in the Ohio river, and some of its larger tributaries, and attains a large size in some portions of the Tennessee river, has also been found in Mississippi and Georgia, as well as in the rivers of Alabama. Mr. Tryon separates the Alabama shells under the name *M. Nolani*. A number of years ago, Mr. Lea described *Paludina coarctata* and *P. incrassata* from the Coosa river. From a careful comparison of numerous specimens of *Melantho* from the Coosa with shells from other regions and with Mr. Lea's unpublished figure of *coarctata*, it is inferred that *coarctata* and *incrassata* are identical with the shells Mr. Tryon calls *Nolani*. It may seem improbable that a species can exhibit so much variation in form in one locality; but it is apparently an unde-

niable fact, and has a parallel in the two species (?) described by Mr. Anthony as *Pal. subsolida* and *P. exilis*, both referable to the sexual varieties of one species. (In this connection it may be remarked that two specimens of this variable species served as illustrations of the male and female of *Melantho integer* in a work on the shells of North America.) Mr. Lea's *coarctata* is the slender form of the species. His *incrassata* is an immature specimen, the apex of which has been removed by erosion. If the species really be distinct from *ponderosus* it should receive the name *coarctata* or *incrassata*, either of which has priority of *Nolani*. A slender variety of *M. decius* occurring in Big Prairie Creek has been confounded with the Coosa shell that Mr. Lea calls *coarctata*. There are peculiarities of form and color that should forbid the association of the Prairie Creek shell with the Coosa River *coarctata*.

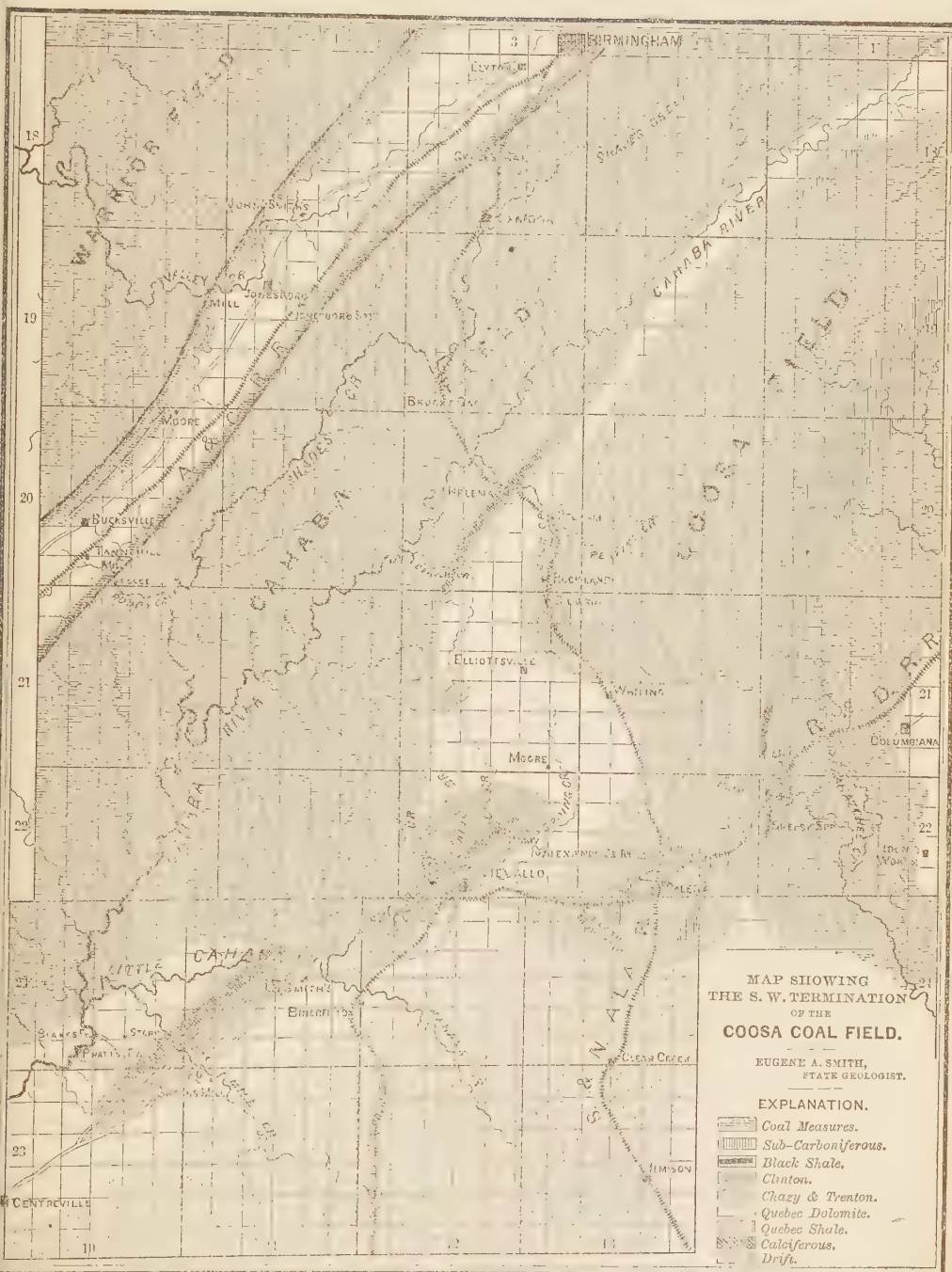
M. decius, *M. ponderosus* and *M. rufus* occur together in Talladega Creek. They are all in a considerable degree characterized by the shouldered suture which distinguishes Mr. Conrad's *geniculus*.

M. lima, *Anthony*, occurs at Huntsville. It seems to be somewhat nearly related to *M. De Campi*. *W. G. Binney*. Possibly a full series of specimens might establish their identity.

Specimens doubtfully referable to *Lioplax subcarinata* have been presented as coming from the Coosa river. The specimens referred to have not the peculiar *salmon tinted* upper whorls that characterize *cyclostomatiformis* from the Coosa and Cahawba rivers, and differ in other respects also. It would be interesting to verify the occurrence of both these species in the Coosa river.

APPENDIX TO THE PULMONATA.

The fresh water pulmonates of Alabama seem not to have been thoroughly studied, and there are available no records that locate a considerable number of species which might very reasonably be expected to occur in the State. A large share of these have been omitted from the list—only such species being included as have a local record within the limits of the State or within contiguous portions of adjoining States. The land shells, having been more thoroughly studied, afford sufficient records to make it probable that only a few species likely to occur within the limits of the State have been omitted. It is quite probable that a careful exploration of the mountains in the northern part of the State may bring to light some of the few species that have recently been described as occurring in the not distant mountains of Tennessee and North Carolina. One of these—*Mesodon Chilhoweensis*, *Lewis*, occurs in northern Georgia, as is established by an immature specimen in the National Museum; and the occurrence of this species in East Tennessee and Georgia would seem to warrant the expectation that it might also be found in Alabama.



MAP SHOWING
THE S. W. TERMINATION
OF THE
COOSA COAL FIELD.

EUGENE A. SMITH,
STATE GEOLOGIST.

EXPLANATION.

- Coal Measures.
- Sub-Carboniferous.
- Black Shale.
- Clinton.
- Chazy & Trenton.
- Quebec Dolomite.
- Quebec Shale.
- Calceiferous.
- Drift.



